

# LANDSCAPES OF (RE)CONQUEST

## Frontier Dynamics in Medieval Iberia and Occitania

*Edited by Aleksander Pluskowski, Guillermo-García Contreras  
and Michelle Alexander*





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FRONTIER DYNAMICS IN MEDIEVAL IBERIA AND OCCITANIA

*Edited by*

ALEKSANDER PLUSKOWSKI,  
GUILLERMO GARCÍA-CONTRERAS *and*  
MICHELLE ALEXANDER



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## List of contributors

MICHELLE ALEXANDER  
University of York, UK

TATIANA ANDRÉ  
Aix-Marseille University, France

JESÚS ALBERTO ARENAS ESTEBAN  
Universidad a Distancia de Madrid, Spain

ROWENA BANERJEA  
University of Reading, UK

ALEX BROWN  
Wessex Archaeology, UK

JESÚS BRUFAL  
Autonomous University of Barcelona, Spain

JEAN-MICHEL CAROZZA  
La Rochelle University, France

MAITE I. GARCIA-COLLADO  
University of the Basque Country / University of York, UK

GUILLERMO GARCÍA-CONTRERAS  
University of Granada, Spain

MARCOS GARCÍA GARCÍA  
University of Granada, Spain

SAMANTHA GREEVES  
University of York, UK

KEVIN M. J. HAYWARD  
Independent researcher, UK

YAIZA HERNÁNDEZ-CASAS  
University of Granada, Spain

CAMILLE HERVY  
ISEM, University of Montpellier, CNRS, IRD, France

MARGOT HOFFELT  
ACTER/LA3M, Aix-Marseille University, France

HELENA KIRCHNER  
Autonomous University of Barcelona, Spain

NICOLÁS LOSILLA  
University of Granada, Spain / ISEM, University of  
Montpellier, CNRS, IRD, France

DAVID MASO  
Independent researcher, France

LUCA MATTEI  
University of Granada, Spain

LIONELLO MORANDI  
University of Pisa, Italy

MERCEDES MURILLO-BARROSO  
University of Granada, Spain

THIERRY PASTOR  
ISEM, University of Montpellier, CNRS, IRD, France

ALEKSANDER PLUSKOWSKI  
University of Reading, UK

CAROLE PUIG  
FRAMESPA, University of Toulouse-Jean Jaurès /  
ACTER, France

JÉRÔME ROS  
ISEM, University of Montpellier, CNRS, IRD, France

AUDREY ROUSSEL  
Côte d'Azur University, France

PHILLIP TOMS  
University of Gloucestershire, UK

DIANNE UNSAIN  
Stockholm University, Sweden

ANTONI VIRGILI  
Autonomous University of Barcelona, Spain

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# **PART 1: INTRODUCTION**



# Frontier societies in the medieval western Mediterranean: Historical framework and concepts

*Guillermo García-Contreras, Michelle Alexander  
and Aleksander Pluskowski*

## Introduction

This book presents a new inter-regional study of medieval frontier societies, through a comparison of four contrasting regions in the western Mediterranean: three in Spain (Guadalajara, Andalusia and western Catalonia) and one in Pyrenean France (south-eastern Occitania). Frontiers have remained a prevalent theme within medieval studies. They are a defining feature of ‘Europeanisation’ – the growth of Latin Christendom, but also of the development of every medieval polity (Bartlett and MacKay 1989; Poisson 1992; Bartlett 1993; Power and Standen 1999; Abulafia and Berend 2002; Merisalo 2006; Muldoon and Fernández Armesto 2008; Murray 2014; Leighton *et al.* 2022). At the same time, they provide the opportunity to de-centre European perspectives, by examining the spaces of non-Christian societies which have often become marginalised in national historical discourses. In the words of Asa Eger (2019b), the study of frontiers has provided a ‘tool for viewing alternative histories, interactions and processes that we might otherwise neglect’.

Scholarship on frontiers can be divided into two broad categories (Berend 2005). Firstly, as the study of historical geography – the spatial development of borderlands around settlements, regions and states. Secondly, as the study of ‘frontier societies’, regarded as composite and distinct from those in political heartlands, rather than simply extensions or replications of expanding states (Haug 2019). Medieval frontiers did not exist as solid lines on maps or in the landscape, even as they were defined through propriety and the administrative division of space. Nominally, they could be connected to natural landmarks such as rivers or mountains. In practice, they functioned as geopolitical zones defined by opposing spheres of influence, contact and connectivity. They were also spaces of variable

permeability, where people and their animals, commodities and ideas could move across territorial boundaries. Commerce is often cited as the most visible expression of this movement (Rodríguez-Picavea 2005, 275), and related to this, the most striking example of frontier permeability is the mid-14th-century Black Death Pandemic. Pathogens were able to traverse along international networks spanning and connecting Eurasia and North Africa (Gómez and Verdú 2017). Due to this permeability, frontiers became the focus of multiple and competing meanings. They tested the abilities of state authorities to control their borderlands and disrupted agendas promoting cultural homogenisation (Wilson and Donnan 1998).

This was particularly true of medieval frontiers created following military conquests and territorial annexations. Governance at the frontier was typically delegated to representatives or allies of the state. Their presence was symbolised by fortified residences – castles, which defined the political landscape. In this respect, frontiers developed their own centres, whose importance could change over time. Some have even suggested that centres were the dominant feature of medieval societal organisation, whether in frontiers or political heartlands (Dangler 2006, 23). As a result, frontiers are no longer understood as culturally and economically depleted peripheries, subservient to the core in an unequal exchange. The range of different groups already inhabiting, drawn to or encouraged to move to the frontier resulted in a spectrum of interactions and agencies. This, in turn, led to varying degrees of assimilation, acculturation, transculturation, resistance and resilience, inflected by unequal power relations. More than a blend of linguistic, religious and ethnic groupings, frontiers can be regarded as transformative spaces in their own right; places of ethnogenesis, where new social configurations were created (Kopytoff 1987; Curta 2005, 5).

The historical, literary and art-historical study of medieval frontiers has long been matched by archaeological research. This has been multidisciplinary, combining landscape and site-specific approaches with written and cartographic sources. Like historians, archaeologists (here including architectural studies) have focused on both the spatial characteristics of borderlands and on the range of social interactions within frontier societies. Central to this research has been the identification of the material traces of difference, usually defined in ethno-religious terms. This has included new and composite material culture and practices resulting from encounters between different groups, in some cases their interpretation informed by post-colonial theory (e.g. Naum 2010; see also García Contreras 2021). Frontiers are studied by archaeologists as multi-scalar spaces: from the dietary remnants and ceramic consumption practices of individual households through to regional settlement patterns. Their permeability has also been examined in the form of traded commodities and isotopic analyses of human and animal remains measuring long-distance movements (see Chapter 2). But perhaps most importantly, the long-term perspective offered by archaeology provides a context for the tempo of change in a frontier. There has been a tendency in recent scholarship to hyperbolise the geographic and cultural fluidity of these spaces, giving the impression they were constantly morphing. In fact, frontiers were not ‘constantly’ shifting, but were defined by periods of stability in relation to neighbouring territories that permitted the construction of fortifications, towns, villages, economic and religious infrastructure. Frontiers were regions with fixed temporality; some remained static in the landscape (perhaps with minor territorial adjustments) for centuries, defining the lived experience of multiple generations. Others were rapidly dissolved and recreated elsewhere within years or decades. Measuring diachronic changes in settlement patterns, sacred spaces, road networks and the use of the landscape all contribute to contextualising the impact of a mobile territorial boundary, and the encounters between the different groups caught up in or attracted to its space. The notion of conflict also remains important to the concept of a frontier (Dauphant 2020, 7).

Whilst various syntheses have provided national or inter-regional frameworks for understanding state formation in medieval Europe, the detailed study of frontiers remains largely siloed into regional histories and archaeologies. Comparative, trans-regional research is unusual, although it is growing. Edited volumes, which are often the landmarks of scholarship on frontiers, have included a range of regions and themes, but they are essentially miscellanies, further subdivided by specific disciplines or categories of evidence. Regional scholarship has in turn, rarely been comparative. Detailed inter-regional studies have been undertaken for early medieval north Iberia, based on charters

(Castro *et al.* 2022), the Norman ‘edge’, based on a range of documentary and literary sources (Stringer and Jotischky 2013, 2019) and the eastern Baltic, using multiple lines of archaeological, environmental and historical evidence (Pluskowski 2019). These have emphasised the interconnectivity between regions, the role of centres and local variability. In the process, they have challenged Bartlett’s thesis of cultural replication, demonstrating the expansion of Europe resulted in diversification (Berend 2006, 178; Barton 2010). This study represents a new contribution to this growing body of scholarship.

## Frontiers in medieval Iberia

### *Frontier historiography*

Iberia has often been described as the quintessential frontier society (or rather societies) of the European Middle Ages, with its prevailing historical narrative defined in relation to the shifting borderlands between opposing Christian and Muslim states that endured for almost eight centuries (Ayala Martínez *et al.* 2001). Culturally, the Peninsula and its neighbouring islands were connected to France in the north and northern Africa to the south, occupying an intermediary space in the western Mediterranean. Medieval Iberian frontiers are certainly the most intensively researched, generating a vast body of Spanish, Portuguese, French and Anglophone scholarship. Most recently, frontier studies have begun to encompass Spanish and Portuguese expansion across the Atlantic (García Fernández *et al.* 2019), although the colonial link to the expansion of medieval Iberian Christian states was made much earlier (Sánchez-Albornoz 1956, 508). The term *fronterizo* has been used to refer to people or cultural practices that were the products of the Christian-Muslim frontier, but virtually the entirety of medieval Iberian history (and especially al-Andalus) is connected with this in some way (Toubert 2001, 4). Research into the territorial and cultural impact of the Christian conquests remains haunted by the anachronistic term *Reconquista* (Reconquest), and the study of Iberian frontier societies remains tethered to the equally problematic term *convivencia* (coexistence) (see below).

Much of the scholarship on medieval Iberia has been characterised by a dichotomy between national and regional approaches. Historical narratives framing the singularity of the Spanish nation had already been critiqued from the mid-19th century by regionalist (sometimes also referred to as nationalist) histories in Catalonia, Galicia and the Basque Country. Liberal scholarship highlighted Andalusí artistic and scientific achievements as key elements of national heritage. Although this had an orientalist background, it enabled the Islamic period to be integrated into overarching historical narratives (García Sanjuán 2020, 140). In contrast, Spanish Catholic nationalist historians devised the concept of *Reconquista*, looking to the unification of Castile and

Aragón in the 15th century for the origins of modern Spain, *contra* al-Andalus. This paradigm was encouraged under the Franco regime (Ortiz Pradas 2017; García Sanjuán 2018), although roles for regional identities, albeit homogeneous ones, were accommodated within this (Clarent Miranada and Fuster Sobrepere 2021). With the recognition of Spain's autonomous regions' right to self-governance in the constitution of 1978, there was a renewed emphasis on regionalist historical narratives (García de Cortázar 2009). Scholarship in Portugal followed a similar trajectory, including an orientalist phase of interest in Andalusí heritage centred on the Algarve and Alentejo in the late 19th and early 20th century, but this was sidelined by its nationalist authoritarian regime until 1974 (Fabião 1996, 90; Vakil 2003a, 8–9). In both Spain and Portugal, castles served, and continue to serve, as nationalised geographical and chronological markers of the *Reconquista* – of the frontier – reinforcing the prevailing narrative of Catholic triumphalism (Vakil 2003a, 5).

In the 1980s, the 'spatial turn' in Spanish historiography was spearheaded by the work of José Ángel García de Cortázar (1988) on the social organisation of space. This ultimately became connected to the process of feudalisation, which remained the dominant conceptual framework for the study of the early medieval period, inspired by the French *Annales* school and Marxist notions of a class struggle (Barbero de Aguilera and Vigil Pascual 1978). This included the regional study of frontiers, whose expansion became connected with the process of feudalisation. At the same time, scholars demonstrated that specific social groups were the product of the historical processes that created the frontier and the environment they found themselves in, such as migrating Jews (Ray 2006). From 1986, Spain and Portugal's membership of the European Union coincided with growing interest in comparative studies, situating Iberia within its broader European context. At the same time, the regional character of Iberian history enabled critiques of more generalised European narratives (Sabaté 2010). The study of the environment became one of the themes also developed by historians (Glick 1996; Clemente Ramos 2001), which included spatial approaches to the borderlands, as well as various aspects of regional frontier societies (Rodríguez de la Peña 2009). A significant body of Anglophone scholarship has also focused on medieval Iberian frontiers, with emphasis shifting from the study of spatial movements to the interaction of different cultures (Bishko 1980; Stalls 1995; Linehan 2001; Lay 2009; McCleery 2015). Further internationalisation of medieval Iberian scholarship has taken place within the field of crusading studies, particularly from the 1990s with the emergence of the 'Pluralist School', which recognised crusading as a pan-European phenomenon (García-Guijarro Ramos 2015).

Medieval archaeology also began to rapidly develop in Spain and Portugal in the 1980s. This became

compartmentalised into Visigothic (i.e. late antique/early medieval) Islamic (or Andalusí) and Christian (or feudal, i.e. later medieval) archaeologies, although the boundaries between these have begun to blur (Fernandes 2005; Quirós Castillo 2009, 174–176). Frontiers became most intensely studied within the framework of Andalusí archaeology in Spain, in relation to two developments. Firstly, the research group Toponimia, historia y arqueología del reino de Granada (THARG), founded at the University of Granada by Antonio Malpica Cuello in 1989, emerged as the leader in Islamic archaeology in Iberia and adopted an interdisciplinary approach to the landscape, in particular, to understand the social and economic structures of the Nasrid emirate (Curta 2011). Secondly, Miquel Barceló (*et al.* 1996) and subsequently Helena Kirchner (2010), developed the sub-field of hydraulic archaeology in Catalonia and the Balearic Islands. This too adopted an interdisciplinary approach, connecting the study of Andalusí settlement with irrigation, agricultural production and socio-economic identity (Torró and Guinot 2012). This has recently begun to extend its chronological framework to encompass the impact of the Christian conquests on the organisation of the landscape (Torró and Guinot 2018; Kirchner and Sabaté 2022). In a parallel development, the PaHisCat (Historic Landscape of Catalonia) project has been applying the principles of Historic Landscape Characterisation to map two millennia of land use in Catalan regions (Bolòs 2010). These developments have been inspirational for this study, although it is important to also mention the importance of Quirós Castillo's (e.g. Santeramo *et al.* 2019; Quirós Castillo and Nicosia 2019; Quirós Castillo and Vigil Escalera-Guirado 2019) environmental and landscape approach to the medieval peasantry in northern Iberia. In contrast, the study of the frontiers of Islamic polities beyond Spain has been comparatively limited, and largely focused on written sources (Brauer 1995; Haug 2011; Zadeh 2011; Kennedy 2018), although there is increasing archaeological research on this topic (Eger 2019a).

The archaeological study of the medieval Christian frontier has been largely defined by a focus on castles. Indeed, the large number of castles in Iberia has long been connected with the history of frontiers and state formation. The Spanish association concerned with the preservation of castles (*Asociación española de amigos de los Castillos*)<sup>1</sup> estimates there are more than 10,000 fortifications across the country, of which at least 3000 could be considered to date to the medieval period. These take a variety of forms, from single towers to larger fortified settlements. No official inventory exists, although some 500 castles have been excavated and published (García Contreras *et al.* 2023). Castle studies in some parts of Europe have increasingly incorporated landscapes and associated settlements, but in the case of Iberia, these sites have traditionally been detached from their broader geographical context, especially



in terms of long-term territorial reorganisation and their relationship with cultural transformation. This has begun to change, and the archaeology of castles has transitioned from being the study of monuments to an investigation of their role in settlement and territoriality (Fábregas and Sabaté 2015); an archaeology of *incastellamento* (Quirós Castillo 2009, 182). Castles are also understood as one of several settlement components in inter-disciplinary studies exploring the formation of medieval Christian territories, although these remain limited (e.g. Escalona 2002). In particular, an archaeology of micro-regions or ‘small worlds’ offers a means of critiquing simplistic models of political agency in the medieval Iberian countryside (Quirós Castillo 2020). Peasant agency is now recognised as a major driver of change in both early medieval al-Andalus and northern Iberia.

The contribution of medieval archaeology to the study of Iberian frontiers has been acknowledged by some historians (e.g. Toubert 2001, 4; Glick 2005, xv), but archaeological evidence features infrequently in historical syntheses of medieval Iberia (Quirós Castillo 2009, 178). Perhaps this is the result of lingering period divisions between the archaeologies of medieval Iberia resulting in disjointed or cellular narratives, whereas historians have crossed these boundaries in their studies of frontier societies. In this respect, the interdisciplinary study of medieval frontiers in Iberia provides the opportunity to bridge the divide between Andalusi/Islamic and feudal/Christian archaeologies. This will also result in the further integration of al-Andalus into the broader field of medieval European archaeology, and in turn, into Iberian and European heritage (García Contreras 2021).

### ***The emergence and movement of the Iberian frontier***

The Arab-Berber conquests which began in 711 saw the reorganisation of the Visigothic kingdoms within a few years into a new Islamic polity, al-Andalus (Fig. 1.1). This became centred on Córdoba from 756. Initially styling themselves as emirs, the Umayyad rulers finally broke away from the Abbasid caliphate in 929, when Abd al-Rahmān III adopted the title of caliph (Fig. 1.2). Regime change was accompanied and consolidated by migrating Arab and Berber elites, and large numbers of peasants organised into Arab and Berber clans, who established new settlements and nearby irrigated fields across the Peninsula and Balearic Islands. This facilitated a new era of urbanisation, with some existing Visigothic centres occupied, new towns established and others abandoned. All of this transformed much of Iberia’s social, economic and religious systems, although the small numbers of Christians (Mozarabs) and Jews who did not become Islamised were permitted to follow their beliefs and paid a special tax,

as with *ahl al-dhimma* elsewhere. The conquest stretched across the Pyrenees with the annexation of the Visigothic kingdom of Septimania in the 720s. However, it was not consolidated in the northernmost mountainous regions of Iberia, where urban networks were limited and there was a long history of resistance to centralised rule (Manzano Moreno 2021).

In 721, an Aquitanian army inflicted a significant defeat on Umayyad forces at Toulouse, but the conquest of Septimania continued for several more years. Later Frankish chroniclers would give all the credit for saving Christendom to the larger-than-life forebearer of the Carolingian dynasty, Charles Martel, who was said to have won a decisive victory at Tours in 732 (Fouracre 2000, 84–88). Following the conquest of Narbonne in 759, Septimania came under Frankish control. In the following decades, Charlemagne’s conquests pushed the frontier with the Umayyad state south of the Pyrenees. This became referred to in Carolingian sources as the *Marca Hispanica* – the Spanish March, a frontier zone with its governance delegated to counts. The frontier counties evolved into independent lordships as Frankish royal control over the south gradually disintegrated. This coincided with feudalisation, insofar as lords began to exercise more power over the peasantry (Mínguez 1994; Chandler 2013; Martínez Llorente 2014). Asturias, which had resisted Córdoba’s authority, had undergone its own transformation into a cohesive state. Its dramatic territorial expansion between the mid-9th and mid-10th century was twinned with a claim that its kings were the inheritors of the Visigothic kingdom of Toledo (Martín Viso 2023). Asturias would merge with the kingdom of León, and as boundaries shifted other Christian realms emerged, which included Castile and later Portugal (João Branco 2023). These states would also undergo feudalisation, here connected to the development of monarchical power (Gutiérrez González 1995). This political transformation has been contrasted with the segmentary society of al-Andalus, and remains the prevailing framework for understanding societal differences on either side of the religious divide. The northern Christian polities began to lead a series of military campaigns into Andalusi lands with the explicit aim of annexing territory (Fig. 1.3). This incrementally saw their frontiers move southwards, particularly from the early decades of the 11th century, when internal power struggles broke up the Córdoba caliphate into smaller principalities or taifas, centred on large towns (Manzano Moreno 2006) (Fig. 1.4). This was the first of three taifa periods between the 11th and 13th centuries, which resulted in a shifting mosaic of internal and external frontiers within the shrinking territory of al-Andalus. The Christian conquests moved incrementally and strategically, seizing cities in major river valleys. This gave the shifting frontiers – eventually understood as a single frontline – a pronounced topographical character.

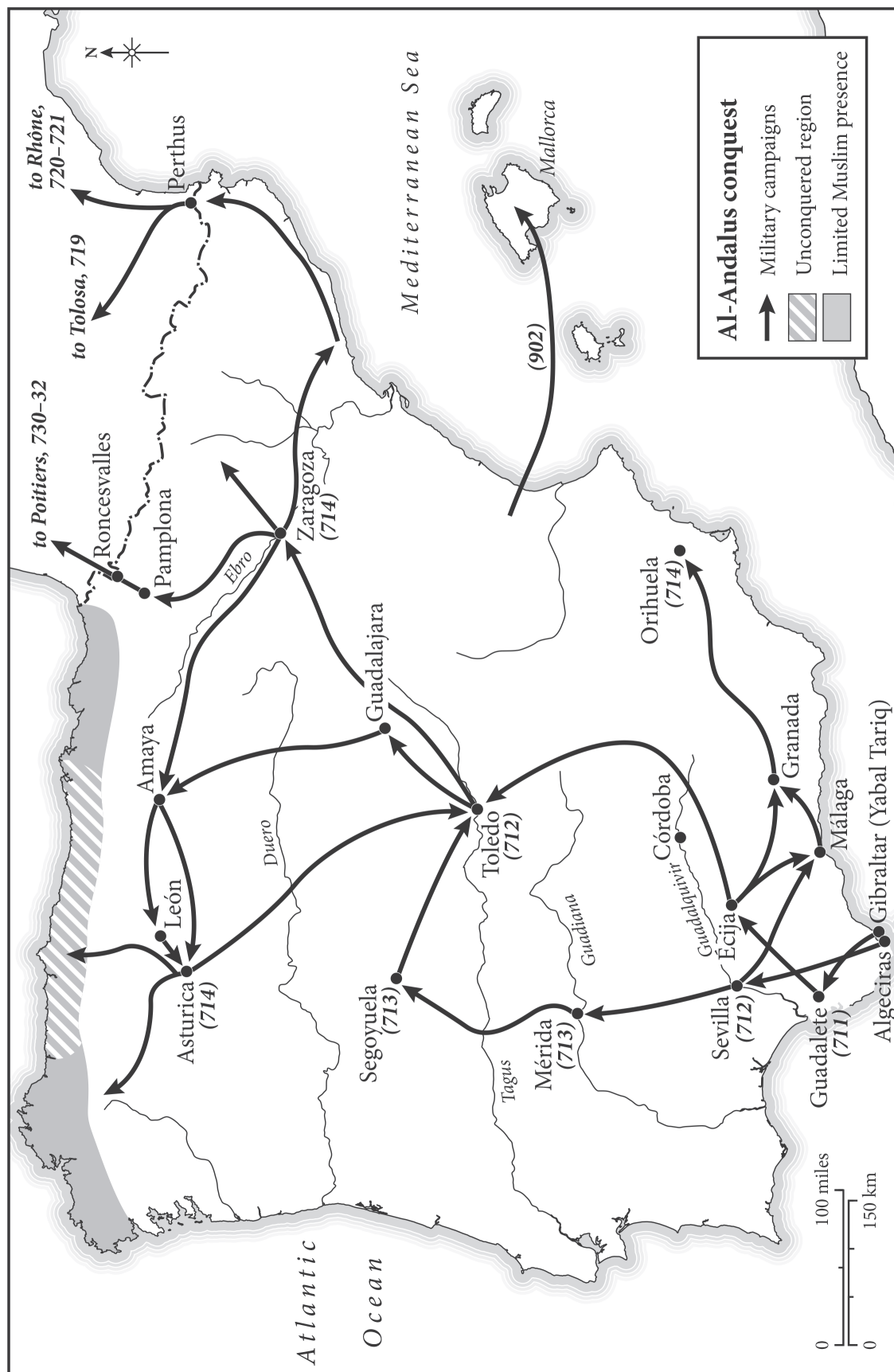


Fig. 1.1. Map showing the Arab-Berber conquests of Iberia and the creation of al-Andalus

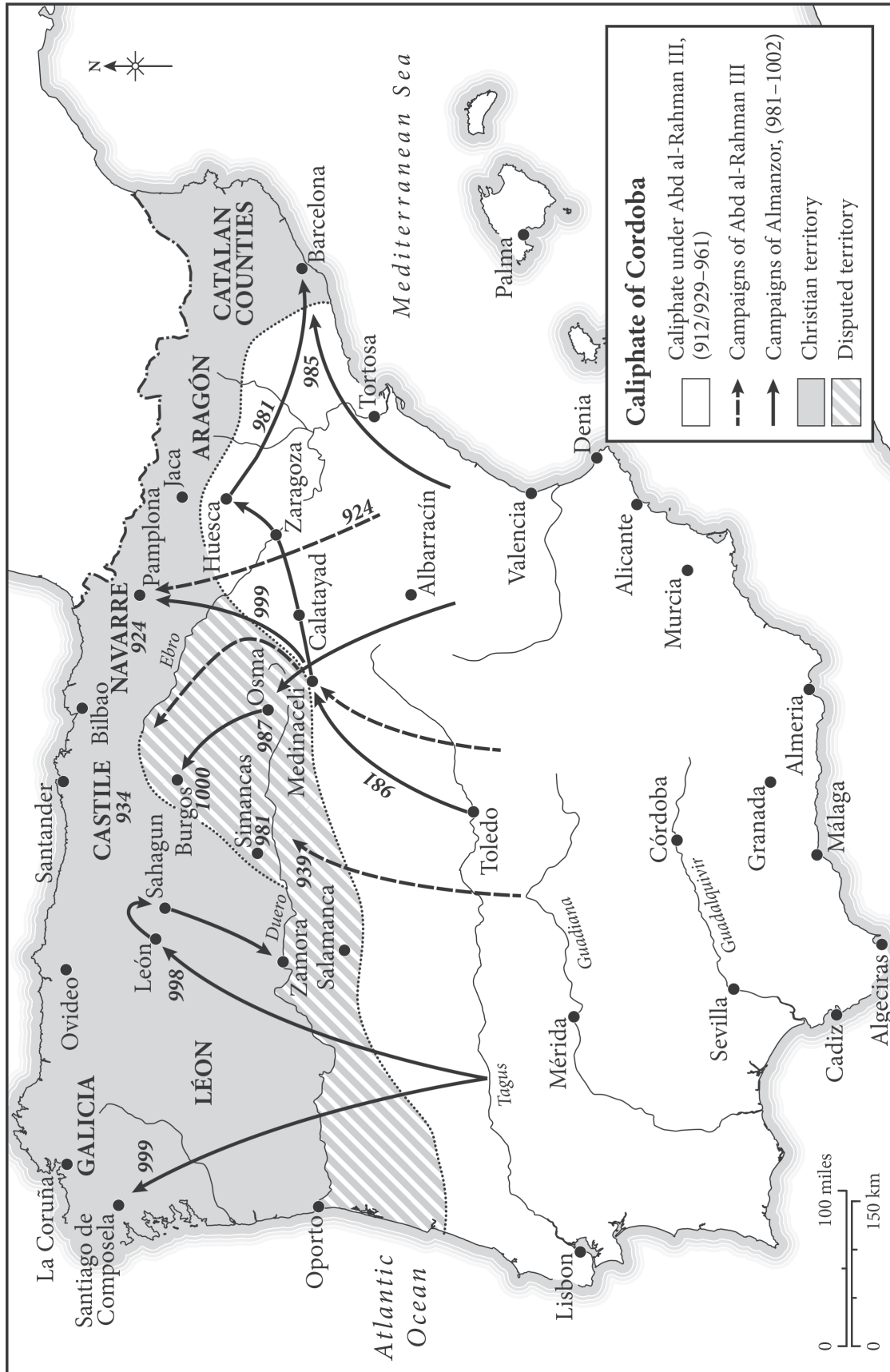


Fig. 1.2. Map showing the Caliphate of Córdoba and campaigns against the northern Christian territories

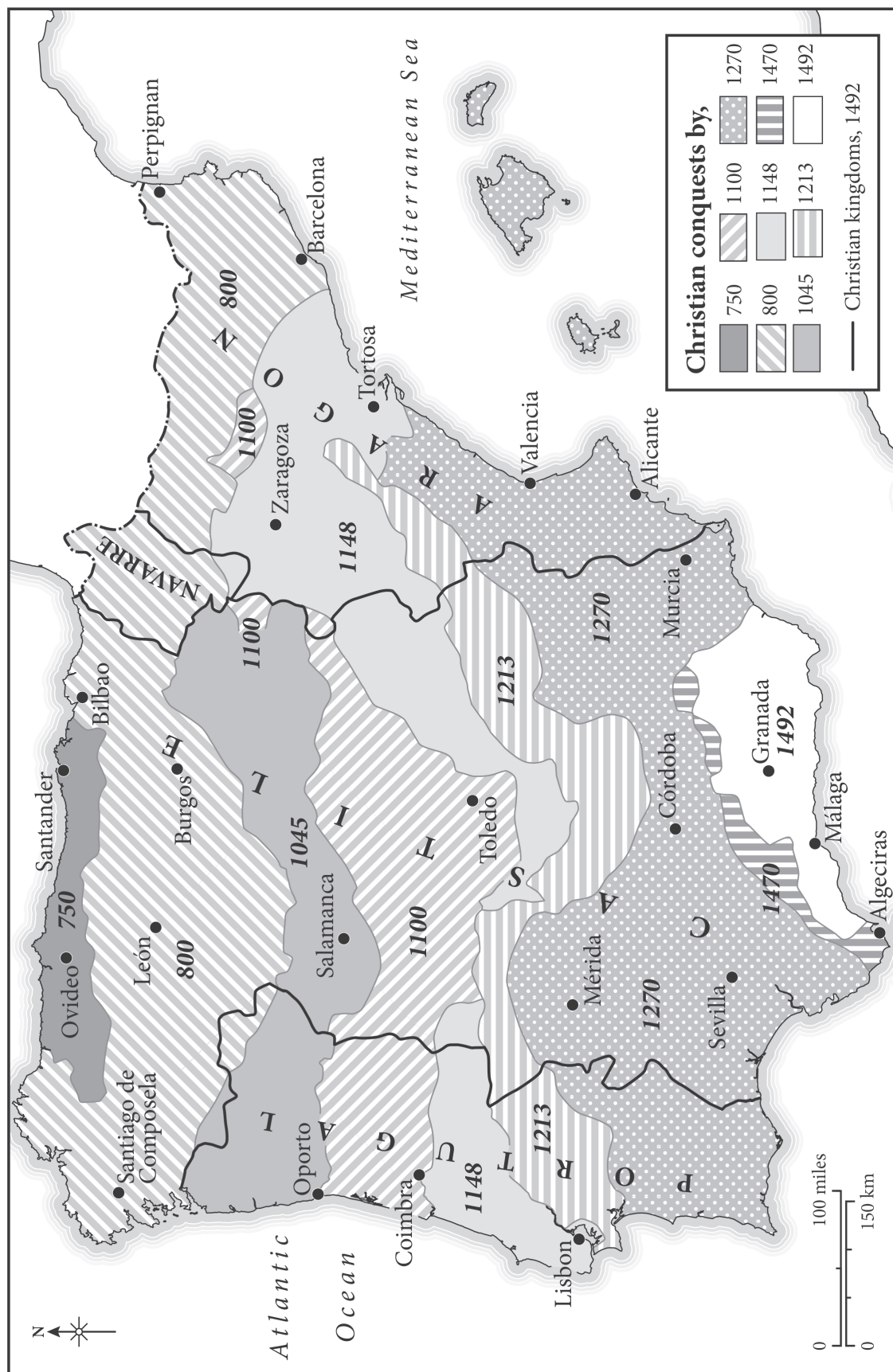


Fig. 1.3. Map showing the incremental Christian conquests of al-Andalus and the southwards movement of the frontier

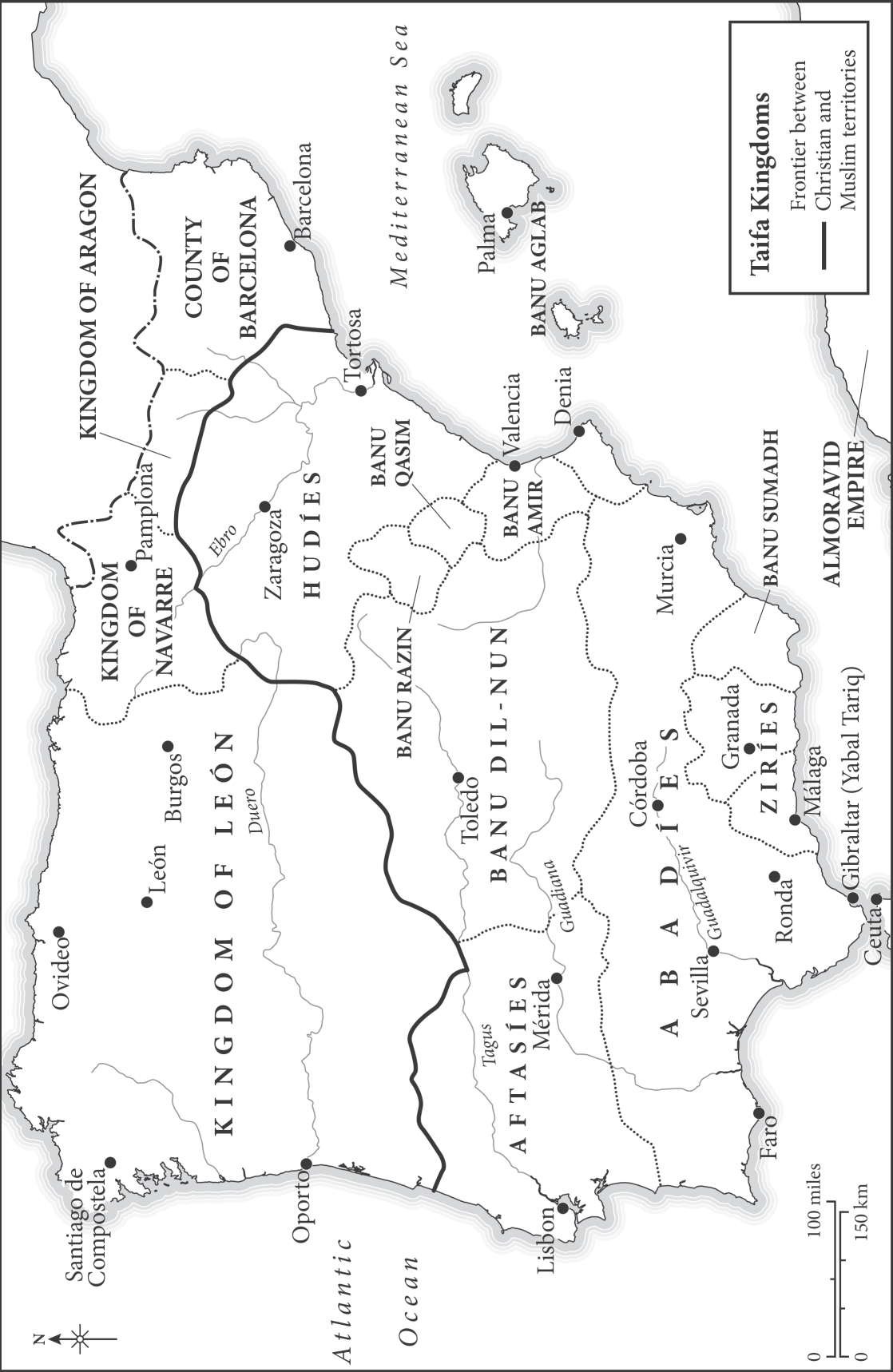


Fig. 1.4. Map showing the taifa kingdoms in Iberia in c. 1080



The intervention of the Almoravids and Almohads slowed down the expansion of the Iberian Christian kingdoms, now dominated by Castile, Aragón and Portugal. But after the defeat of the Almohad army at Las Navas de Tolosa in 1212 and the collapse of Andalusi political unity leading to the third period of taifas, the frontier was pushed significantly to the south (Fig. 1.3). Castilian forces conquered Baeza in 1226, Úbeda in 1233, Córdoba in 1236, Jaen in 1246 and Seville in 1248. Aragonese armies conquered the Balearic Islands between 1228 and 1232, Valencia in 1238, then a few decades later defeated the Taifa of Murcia, which would be annexed by Castile in 1266. At this point the frontier stabilised between Castile, now the most powerful of the Iberian Christian kingdoms, and the one remaining Andalusi polity – the Nasrid Emirate of Granada. The frontier would move in parts between 1292 (the conquest of Tarifa) and 1462 (the conquest of Gibraltar), but the Emirate retained most of its territory until the ‘Granada War’ in 1487–1492 (Malpica Cuello 2014). Muslims who found themselves under Christian rule became referred to as Mudejars (from the Arabic ‘subjugated’), whilst those who converted to Christianity were referred to as Moriscos from the 16th century.

The conceptualisation of frontiers in medieval Iberia is documented in contemporary written sources. With the creation of new administrative divisions by the Umayyads, the borderlands of al-Andalus were framed in similar ways as in other parts of the Islamic world. For Muslim geographers, the political realm of Islam, the *dar al-islam* (house of peace), was separated from the lands of non-Muslims, the *dar al-harb* (house of war). The frontiers between the two were referred to in Arabic as *thughūr* (sing. *thaghr*). This term alluded to the gaps in a borderland defined by a hypothetically permanent state of conflict with the non-Muslim other; entry points for both enemies and state sponsored military campaigns, and reflected the frontier as a place of intrusion (Haug 2019). Graphic representations of boundaries are largely absent from medieval Islamic cartography, which instead emphasised political centres and somewhat abstract internal sub-divisions. In the case of *thughūr*, these were broadly defined as the meeting points of Muslim and Christian spheres of influence emanating from borderland centres. But they were also zones of military organisation, with visible investment in fortification (Brauer 1995, 28). In the Umayyad caliphate, *thaghr* was used to refer to at least two principal borderlands with northern Christian territories, commonly translated as the ‘upper’ and ‘middle’ marches. Some Arabic chronicles referred to three or four marches (Rodríguez-Picavea 2005, 283). The terms became so established that they were adopted by later Christian regimes; for example, the Andalusi population inhabiting the frontier of Aragón became known as *tagarinos* (Brisville-Fertin 2016).

The term *frontera* first appears to describe the Christian borderlands with al-Andalus in Aragonese sources in

1059, within a military context (Sénac 1999). It has been suggested that the mountainous southern edge of Aragonese territory at this time may have prompted the adoption of this neologism (Buresi 2011, 82–83). In León-Castile, the term was used by Fernando II in 1171 and Alfonso VIII in 1181, in the context of donations of property to the Order of Santiago in *frontaria Sarracenorum* (see below). The term’s use proliferated in the 1220s with similar royal donations, whilst Fernando III declared in 1222 that it was a royal duty to defend the kingdom’s frontiers, as defined by a series of fortresses or rivers (Linehan 2001, 46). Before the popularisation of *frontera*, other Latin terms were used to define borderland spaces with al-Andalus which contrasted them from Christian heartlands, such as *fines*, *extremum*, *confin* and the Carolingian *marca*. These were also used in other regions of Catholic Christendom, sometimes interchangeably. Above all, these spaces were defined explicitly in relation to opposing Andalusi polities, a juxtaposition that became framed in religious terms.

### *Framing the religious frontier*

From the 9th century, Catholic polemicists were using a notion of *christianitas* (Christendom or Christianity) to muster support within Christian lands against specific enemies. These could include other Christians (Berend 2022), but a separate collective identity was given to non-Christians beyond the *fines* of Christian territories. These were *pagani*, a term used to refer to all non-Christians (with the exception of Jews, due to their shared biblical heritage). From the perspective of the Church, these frontiers became framed as spaces of religious deficiency; their pagan (or in some cases, those deemed heretical or schismatic) inhabitants in need of evangelisation (Perron 2009). For territorial powers, the expansion of their realms became twinned with the defence of Christianity (Berend 2003). In this respect, certain frontiers with pagan lands became ideologically connected with missionary activity (expanding the borders of Christendom) and crusading (defending those borders) (Hunyadi and Laszlovszky 2001), as Christianity became territorialised. In the case of Iberia, there is evidence for the conceptualisation of a singular frontier defined by religious opposites.

Between the 8th and 11th century, some historians have argued that religion had played a minor or negligible role in how political decisions were made in al-Andalus and the northern Christian kingdoms. There is little indication from contemporary written sources that a Christian-Muslim frontier was recognised. There was certainly no sense of a peninsula-wide borderland. Instead, borders between states were noted without a religious gloss (Christys 2002). This contrasts with the framing of the Carolingian frontier. Charlemagne and his court promoted their campaigns against the Umayyads as



religious wars aimed at protecting Frankish Christians and expanding Christianity in Iberia (Ottewill-Soulsby 2016). The Carolingian influence may, in turn, have linked religious convictions with warfare against al-Andalus in the southern Catalan and Aragonese frontiers in the 1040s (Bautista 2011; Laliena 2015, 122). Ecclesiastics in the northern Iberian states also began to distance themselves from Mozarabs in al-Andalus, as they developed their own sense of religious identity aligned with the Frankish Church and Rome (García-Guijarro 2016). Indeed, the term 'Mozarab' was coined by northern Christians in the 11th century as a part of the denunciation of Christian culture in al-Andalus which was believed to have been 'contaminated' by Arabisation. The Visigothic liturgy was banned in Aragón in 1071 and in Castile in 1080 (Bennison 2001, 16).

In Umayyad al-Andalus, a religious dimension to warfare with the Christian states is also evident. The declaration of the Córdoba caliphate saw the recreation of the traditional role of the caliph as the defender of Islam and the instigator of jihad. In relation to this, Umayyad chroniclers framed the attacks against the Christian kingdoms as holy wars, emulating the Prophet's actions against infidels (Albarrán 2018). However, despite this projection in the written sources, power at the frontier was fragmented between various groups, limiting the Umayyad caliphate's unified vision of a holy war against a singular enemy (Manzano Moreno 1991, 387).

Events in the 11th century contributed to defining the frontier in more dichotomous terms, as part of a greater struggle between Christianity and Islam. Reflecting on the events of the First Crusade (1095–1099) in his treatise on holy war, the Damascene scholar and preacher Ali ibn Tāhir al-Sulamī regarded this event as the third in a sequence of Christian incursions against the Muslim world. The first, as he saw it, was the Norman conquest of Sicily in 1060, which took three decades to complete. There was a religious dimension to the takeover. The Norman leader of the Sicilian military campaign, Robert Guiscard, sought endorsement from the papacy to rule over the conquered territories in exchange for an oath of fealty. Indeed, the very process of conquering Islamic lands resulted in the creation of new sovereign governments, which were readily legitimised by the Catholic Church (Chevedden 2010, 201). There was, of course, a more complex political game being played – the Pope's encouragement of Norman power in southern Italy and Sicily also challenged Byzantine hegemony in the central Mediterranean.

The second region where Islam was threatened by Christians according to Ali ibn Tāhir al-Sulamī was al-Andalus. There has been extensive debate between historians regarding the role of the Iberian Christian-Muslim conflicts in shaping the papal ideology of crusading. Some have regarded it as contributing to the success of the Pope's call for crusade in 1095 (e.g. Laliena 2015, 122), others have suggested the

crusading movement would influence Iberian culture (e.g. O'Callaghan 2003). Often cited as a 'landmark' of external influence in Aragonese territorial expansion from the mid-11th century is Pope Alexander II's encouragement of a multinational army to conquer the city of Barbastro in 1064, then situated within the Andalusi Taifa of Zaragoza. In the surviving fragment of a letter to Spanish bishops praising them for protecting Jews during the campaign, the Pope had written, referring to the Muslims, that 'war is waged justly against those who persecute Christians and expel them from their cities and own homes' (Ott 1884, Letter 3). Southern Italians would take note of this event, with the Benedictine monk Amatus of Montecassino highlighting the involvement of the Normans in the siege. He went on to state how the loss of the city to the Muslims less than a year after it had been taken was a consequence of the sins of the conquering Christians (Smith 1988, 84; Oldfield 2008, 314). Papal interest in Iberia mirrored that of Sicily, and both Alexander II and his successor Gregory VII were keen on realising their vision of a single, spiritual community under the aegis of Rome. Gregory had led the drive within the Church for further centralisation, aiming to strengthen Rome's authority, standardise religious practices and regulate the behaviour of its clergy.

In Iberia, this included consolidating papal power over the remnants of the Visigothic or Mozarabic Church, which saw the introduction of the Roman rite under pressure from Gregory VII and the influence of French churchmen and monastic orders. At the same time, the cult of St James in Compostela became tethered to the conflict against Andalusī Muslims. The earliest written evidence for the belief in St James' spiritual intercession in territorial conquest is dated to the 12th century. He then develops as a figure on the battlefield in the 13th century in a process that would transform him into Santiago Matamoros (St James the 'Moor Slayer') in the following century (Gallardo 2005). When the king of Aragón, Sancho Ramírez, swore an oath of fealty to Gregory to secure the legitimacy of his rule against his Christian neighbours, as in the case of Guiscard in Sicily, their mutual interests aligned in the struggle against Islam. Sancho had participated in the siege of Barbastro and a year before Urban's call for holy war, he died after being struck by an arrow at Huesca on the Christian-Muslim frontline (Villegas-Aristizábal 2018). In 1073, Gregory also supported Eble II's (the French count of Roucy) intention to campaign against Andalusī Muslims in exchange for holding the conquered land as a papal fief, but the expedition failed to materialise.

The entry of the Almoravids into al-Andalus from 1086 and the conquest of Jerusalem in 1099 are associated with a sharpening of Christian attitudes to the Islamic world. When Pope Urban called for a new holy war, he was reported to have evoked the glorious reputation of Charlemagne and other ancestral Frankish kings 'who have destroyed the pagan kingdoms and brought them within the bounds

of Christendom' (Sweetenham 2005, 80). The memory of the Carolingian conquests may even have played a role in connecting Frankish chivalric values with the intermittent conflict with Andalusī Muslims, inspiring support for the papal call (Laliena 2015, 122). The term 'pagan' features in the early 10th-century Leonise *Chronicle of Alfonso III* to describe Pelayo's Muslim enemies at Covadonga (Christys 2002, 43), but it starts to appear more commonly in Iberian sources from the 11th century. Previously *sarraceni* was used by Iberian Christian chroniclers to refer to both Andalusī Arabs and Berbers in relation to their geographic origin. With the arrival of the Almoravids, the conflation of ethnic and religious identity becomes visible as *sarraceni* starts to be used to refer to Muslims in general, often with hostile undertones (Oliver Pérez 1994). Some have argued crusading ideology contributed to the development of derogatory religious labels for Andalusī Muslims (Christys 2002).

The enthusiastic response of Iberian knights to the papal call for the First Crusade prompted Urban and his successor Paschal II to urge them to remain at home, and confront the threat of neighbouring Muslim polities. The same spiritual rewards were offered for the *iter per Hispaniam* as for crusading in the Holy Land, officially authorised by Pope Calixtus II in 1123 (Purkis 2008, 123–132). Participants made crusading vows, wore the sign of the cross on their garments, received indulgences and were granted papal legates (O'Banion 2012). As a result, the eastern and western frontiers against Islam were brought together in the minds of the Catholic nobility (Buresi 2011, 98). This was vividly demonstrated by contemporaries recognising how the different theatres of war associated with the 'Second Crusade' – the Levant, Baltic and Iberia – were connected, even if each had its own specific context (Roche 2015, 2–3). Iberian writers also began to link the crusades in the Levant with past and present conflicts with al-Andalus, which included re-imagining Charlemagne's campaigns as a crusade (Wacks 2019). Not all military campaigns against Andalusī territories from the 12th century onwards were papally sanctioned crusades; those that were, typically served pragmatic ends, such as bolstering military forces (García-Guijarro 2016). Iberian rulers and prelates were able to connect crusading ideology with their own political and religious agendas, and it is evident that both the prospects of spiritual salvation and material wealth combined into a powerful motivation for would-be crusaders (Villegas Aristizabal 2017). The battle of Las Navas de Tolosa in 1212 inspired a new wave of crusading fervour in Catholic Iberia, particularly in Castile; by 1217, the *Annales Toledanos* were branding any campaign against the Muslims as a '*cruzada*', and the term began to feature in wills and charters (Gómez 2012).

As crusading became connected to the territorial defence of expanding Christendom, it contributed to a new essentialist notion of the Iberian frontier. Territorial ambitions, for the first time, become explicitly twinned with the defence

of Christianity. For example, in 1134, Raymond Berengar, the Count of Barcelona, granted a castle to the Templars '*ad defensionem christianitatis*' (De Bofarull y Mascaró 1853, 18, no. 6). The presence of various military orders on the frontier contributed to its crusading character by sharpening the religious definition of territory, and with it 'favouring an awareness of alterity' (Pinto Costa *et al.* 2016). Fighting alongside members of the local military orders was framed by the papacy as engaging in holy war (Ayala Martínez 2019). With houses across multiple Christian states, the military orders also contributed to the notion of a unified, trans-regional front against Islam. The frontier was also colonised by monastic orders, with the mendicants playing a variable missionary role (García-Serrano 2020). Iberian ecclesiastics in frontier towns became involved in the preparation of military campaigns into Andalusī lands as well as celebrations for returning troops. The repurposing of the most important mosques into churches and cathedrals also reinforced the ideological elements of the Christian conquests (Harris 1997; Buresi 2000). Despite this religious hostility, there was still pragmatism involved in political relations with Muslim rulers and governing multi-faith populations. This, at times, conflicted with papal policy and even the actions of foreign crusaders participating in Iberian campaigns (Gómez 2011, 238). The history of papal relations with the Iberian monarchies is one of *realpolitik* and occasional competing interests (Powell 1990; Baydal Sala 2017; Forey 2022).

The expression of jihad which defined holy war against infidels, like crusade, was a means of mobilising financing, troops and provisions for military campaigns. Alī ibn Tāhir al-Sulamī had called for jihad against the Franks in the wake of the First Crusade, and in his treatise *Kitab al-Jihad* wrote that caliphs should wage regular war against Christians. His call to arms had little immediate impact in the wider Islamic world. For the Almoravids, jihad had evolved from the struggle against the non-Muslim Saharan nomads, then Muslim regimes in north-west Africa and finally against the Christians in Iberia. As a tool of political legitimacy, it became contested, especially in al-Andalus, but it contributed to redefining the Christian kingdoms in terms of religious opposition, rather than as political rivals (Hopley 2015). When the Almohad caliphs came to govern al-Andalus, they also legitimised their rule by utilising the ideology of jihad against both Christians and Muslims who opposed them, as they had done against the Almoravids (Albarrán 2018). This continued with the Nasrids, as attitudes to Christianity hardened and assertions of Islamic orthodoxy continued. The inscription on the tomb of the dynasty's founder, Ibn al-Ahmar, described him as the guardian of the frontier (*thughur*) along with various military titles, including the subjugator of non-Muslim rulers (*tughat*) and holy warrior. Jihad against the Christian Iberian kingdoms was also promoted under the Marinids in Morocco. Theological debates

within the Nasrid and Marinid capitals criticised Mudejars for having their faith contaminated by Christian rule; the term itself was a slur that paralleled the northern Catholic use of 'Mozarab' (Bennison 2001, 15–17). But it is also important to note that both the Nasrids and Marinids made agreements with the Iberian Christian kingdoms.

In summary, the various frontiers of early medieval Iberia became, in time, framed by essentialist religious categories into one, broader frontier. There were also evident spiritual motivations for military orders and monasteries to establish themselves on the frontier, as well as for people to join calls for crusade or jihad. The reality on the ground, as in Sicily and the Levant, was more complex. Islamisation and Christianisation are now studied as multi-faceted social processes, rather than as simply religious conversion (Carvajal López 2023). These nuances can also be glimpsed in representations of frontiers in both Christian and Muslim literature (Wacks 2007; Montaner Frutos 2018; Weiss 2021). These spaces were framed as exotic, dangerous and exciting; their inhabitants could be noble or savage, admired or feared. The political history of the shifting frontiers, which is well known, provides numerous examples of alliances, treaties and bonds of vassalage which criss-crossed the religious line. Anglophone crusading historians of the pluralist school, with its emphasis on spirituality, have also highlighted the economic and territorial aspects of the military campaigns against al-Andalus (Laliena 2015, 117–118).

### *The territorial reorganisation of al-Andalus*

Enrique Rodríguez-Picavea (2005) proposed four chronological phases (which may be simultaneous or sequential) for defining the creation of the medieval Iberian frontier – military, socio-economic, cultural and political-administrative. These are broadly applicable to both Islamic and Christian polities, but the process of frontier creation is most clearly understood for the latter, given the relative preservation of written sources. The first phase, following military conquest of major centres, demarcated the new political landscape. This was defined by the rebuilding or construction of fortifications, and may have been accompanied by the establishment of new rural settlements and/or the subordination of existing settlements. The physical and symbolic transfer of power was most visibly manifested in substantial investments in these monumental structures. The second phase involved state-sponsored settlement, which included populating urban centres and the countryside with migrants. Accompanying this was the transformation of cultural elements, most notably language, religion and social customs, eventually resulting in a form of cultural cohesion. The final phase saw the consolidation of sovereignty over the territory, the main aim of the monarchical agenda, with the establishment of economic control represented by clear fiscal policies. This has been described by some Iberian and Anglophone historians as a colonial process.

In advance of a conquest, rulers made donations of land that would later be seized and subdivided; a means of asserting future suzerainty over an area against competing Christian rulers. In some cases, treaties between kingdoms also subdivided future conquests of Andalusian territory (Guichard 1998). Following the conquest, the new territorial lords would augment their properties with further purchases and exchanges, and religious institutions would receive additional donations. This saw the reorganisation of conquered polities into new territorial units or lordships (*señoríos*), in a process emblematic of feudalisation referred to in scholarship as *señorialización*. The Church also played a fundamental part in integrating conquered territories into the Christian kingdoms, as in other frontier regions. This involved the mapping out of dioceses and parishes, officially incorporating the region into *christianitas*. Rodríguez-Picavea (2005, 286) sees this as an alliance between the monarchical state and the Church.

Governance of newly conquered territory was subdivided between a range of groups, including noble families, bishops, military orders and town councils (Buresi 2011). They were permitted to build castles and launch attacks in Andalusian territory, but the monarchs retained control of minting and the judiciary. The delegation of frontier authority to nobles was relatively unusual and took place early on in the Castilian-Leónese expansion under Alfonso VII. Subsequently, the process became more integrationist, aimed at strengthening monarchical power. The transition from a private to integrationist approach to frontier governance took place at the end of the 12th century. In Castile, this was expressed in the transition of smaller, private aristocratic estates to the larger estates or *latifundia* of the military orders, which then came to dominate the frontier *señoríos* of the 13th and 14th centuries (González Jiménez 1992).

The military orders had played a strategic role in the frontier from the 12th century (Ayala Martínez 2007). Following the establishment of local military brotherhoods in Aragón by Alfonso I, the first international military order to become established in Iberia was the Templars in Portugal in 1128, and in Castile and Aragón from the 1140s. The Hospitallers were also present, but may not have been militarised until the mid-12th century. This was followed by the establishment of local military orders: Calatrava (1158), Santiago (1170), Évora/Aviz (1175) and Alcántara (1176). The Templars would later be reconstituted in Aragón as the Order of Montesa (1317) and in Portugal as the Order of Christ (1319). They acquired landed property, castles, commanderies, held lordship over towns and villages, and played an active military role in campaigns against al-Andalus (Rodríguez-Picavea Matilla 1992). They were also heavily involved in the reorganisation of settlement on the frontier (e.g. Gerrard 1999). However, from the second half of the 14th century and throughout the 15th century, royal grants of lordship in southern Castile resulted in some half of the lands in the region coming under seigneurial control. At the same time,



the practice of establishing *mayorazgos* (entailed estates) resulted in powerful territorial patrimonies, which increased in size with the annexation and enclosure of common lands for pasture (Cabrera 1989).

Following the establishment of a political landscape, state-sponsored colonisation introduced the workings of the 'feudal' system, with town councils, nobles and prelates dominating the new socio-economic structure. Towns became populated by artisans, whilst the majority of migrants in the countryside were peasants. Ethnic backgrounds varied. French settlers played an important role in parts of Aragón and Castile. Jews also contributed widely to the settlement of the frontier (Ray 2006). Migration to new lands was an expensive, risky and emotional experience, and the attraction of improved tenurial conditions acted as a major pull factor (Barton 2010). The aim was to repopulate newly acquired territories with loyal subjects, a process referred to in the scholarship as *repoblación*. This went hand-in-hand with the selective expulsion and reorganisation of Andalusi populations, which occurred in both urban centres and rural areas. Toledo, conquered by Castilian forces in 1085, served as a template for governing Andalusi towns conquered in later years. This included the appropriation of congregational mosques, which were used as organisational points for new urban parishes that replaced the cellular Andalusi neighbourhoods, although not all were immediately converted, especially in the larger cities. Some cities were emptied of populations which facilitated a relatively rapid transformation of the organisation of urban space. Where the Andalusi population remained, the process of parochial development was slow.

Toledo also provided the model for the *fuero* (charter), which would become a feature of the 12th-century Castilian frontier. *Fueros* codified the territorial power and privileges granted to town *concejos* (councils), although they would not be used south of the Tagus. From the 13th century, land was divided amongst new settlers through a process referred to as *repartimientos*. This has left substantial documentation in some regions providing detailed records of land use in the form of *Libros de Repartimiento*. Few *Libros* have survived from the 13th century; the earliest is that of Mallorca from 1232. Their compilation involved the surveying, division and redistribution of property, facilitated by the employment of Arabic-speaking Mozarabs and Jews as administrators (Ecker 2005, 47).

Where they were permitted to stay or did not flee southwards, the community-based political and social agency of Andalusi peasants was replaced by a new paradigm of lordship, which scholarship on medieval Iberia has long defined as feudalism (see Portass 2022 for the historiography of feudalism in I.e. Iberia, and Brown 2022 for a critique of the term). Already visible in the north of the Iberian Peninsula in the 8th and 9th centuries, this saw the development of a political landscape defined by castles, proprietary churches and monasteries, reflecting the growing power of local aristocracies to control

peasant communities and manipulate the cultural landscape (Aguilera and Pascual 1974; García de Cortázar 1999; Sabaté and Farré 2004; Wickham 2005, 535–536). Peasants were still taxed and expected to produce an agricultural surplus to pay the state, but instead of owning their land collectively, they were now tenants paying rents to new lords.

In the last three decades, landscape archaeology has demonstrated how the rural economy was disrupted as a result of political and demographic changes associated with the conquests, and how this varied spatially and temporally (Kirchner and Sabaté 2022). In the 13th and 14th centuries, the term *moro* (Moor), that had also begun to be increasingly used during the Almoravid period, replaced Saracen as a generic label for Andalusi Muslims. By then, Christians, Jews and Muslims were distinguished from each other in written sources on the basis of their ethno-religious identity (Oliver Pérez 1994). Following territorial annexations, separate areas were designated for the three groups, with the aim of limiting interaction between them. Segregation was encouraged by the papacy from the 12th century, born of a fear of the perceived danger to the integrity of the Christian faith (Powell 1990). Social segregation was attempted through the regulation of clothing, food, sexual relations and public spaces (Ray 2006, 145–146).

Muslim communities permitted to stay in towns became concentrated in *morerias*. Jewish communities, in turn, were obliged to reside in specially designated *juderías*, which became fortified urban or peri-urban quarters. These developed into formal Jewish quarters in larger towns in the later 12th and 13th centuries. There were also smaller Jewish communities attached to castles. However, social separation was not always favoured by incoming settlers, resulting in opposition to state-sponsored initiatives. For example, Jewish migrants still chose to reside and work in other neighbourhoods, particularly where the community outgrew the limits of its designated space. There were variable attempts to enforce this segregation from the authorities, at the behest of municipal Christian authorities and Jewish councils, who sought to preserve the integrity of the *juderia*. The frontier society that resulted from this was therefore characterised by multiple communities and identities with local reflexes. Their interaction with others would have ebbed and flowed according to need, interest and circumstances (Jarrett 2017, 35).

Whilst ethno-religious divisions of Iberian frontier societies have attracted substantial scholarly attention, the peninsular geopolitical situation between the 8th and 15th century was also far more complex than simply the southward movement of an essentialist Christian-Muslim borderland. Frontiers not only existed between nominally opposed Christian and Muslim polities, but between those sharing the same religious identities. These were internal borderlands within and between Christian kingdoms, some of which reflected the incremental movement of the external frontier (Barton 2010). This resulted in multiple forces

acting on the process of settlement within any given territory. Rodríguez-Picavea (2005) argued that microsocieties developed at the frontier following conquests by Christian regimes, with more radical feudal divisions than in political heartlands, particularly where the military orders held lordships. The study of frontier societies therefore benefits from regional and local approaches, treating them as ‘small worlds’ (Quirós Castillo 2020).

### *Problematic concepts of the Iberian frontier*

#### *‘Reconquista’: a nationalist paradigm*

The term *Reconquista* is not a medieval concept. It was invented in the 19th century and subsequently popularised by Spanish Catholic nationalist historians with the aim of promoting an agenda of unification. Following this narrative, the process of unification was framed as the direct result of a ‘reconquest’ of Christian Visigothic territories that had been lost to North African Islamic forces. The advancing frontier was therefore both a re-Christianisation and a nationalisation of territory, culminating in the foundation of the Spanish nation. This notion is far more prevalent in Spain than in Portugal, where its use has seen a resurgence within right-wing nationalist circles (Ríos Saloma 2011, 2013; Hertel 2015; García Sanjuán 2018, 2020; Queimada e Silva 2019). Nonetheless, an equivalent promotion (and critique) of the heritage of the Christian conquests is also evident in Portugal (Vakil 2003a, 2003b).

The *Reconquista* narrative presents an essentialist dichotomy between Christianity and Islam as driving the emergence of a unified, modern Spain. Cast in this light, Muslims (and Jews, despite their role in the settlement of Christian territories) in historical and present-day Spain are regarded as a timeless ‘other’, essentially as foreigners illegitimately occupying an inherently Spanish space. This notion was reinforced in anti-Islamic discourse surrounding the 2004 jihadist bombings in Madrid and the terrorist attack in Barcelona in 2017. Although many Iberian scholars have rejected the term *Reconquista* in favour of regional conquests (Torró 2000), it still has currency in both international and Iberian historiography (e.g. O’Callaghan 2003; Purkis 2008; Fletcher 2013; López-Portillo 2013; García Fitz and Novoa Portela 2014; García-Guijarro 2015, 2016; Pinto Costa *et al.* 2016; Kagay 2020; Lara García 2021). After Goñi Gaztambide (1958) framed the *Reconquista* as a sacred war which transitioned into crusading, the contrast between the two as a diachronic process has been adopted by a number of scholars (e.g. Marin-Guzman 1992; Ayala Martínez 2023; cf. García-Guijarro Ramos 2015). Some have even argued for the term’s usefulness as a heuristic device, whilst acknowledging its artificiality. The concept remains popular in the public domain in Spain, and continues to be used for historical anniversaries connected with civic identity, most recently at Sigüenza for the ninth centenary of the ‘Reconquest’ of 1124 (Fig. 1.5).



Fig. 1.5. The logo for Sigüenza’s ‘Reconquista’ centenary (© Lina Vico Diseño)

We have adopted the term ‘(Re)Conquest’ for the title of this study as a means of engaging international readers who are familiar with the term, but perhaps less so with its historiography and politicised usage. Our aim is to highlight its problematic nature more broadly.

#### *‘Convivencia’: a contested paradigm*

The term *convivencia* was developed as a cultural concept by the Spanish historian Américo Castro (1948), then living in exile in the United States. He used it to describe the multi-faith relations in medieval Spain as unique in the history of Europe and the Islamic world. He believed this source of pluralist values could serve as an inspiration for future democratic societies (Ceballos 2020). Castro’s thesis was largely taken up in Anglophone scholarship on medieval Iberia, but also within Jewish Studies (Ray 2005), resulting in a series of works that in some cases emphasised an almost utopian coexistence, particularly in al-Andalus (Fernández-Morera 2016). The frontier, the quintessential space of inter-cultural interaction, became closely associated with the notion of *convivencia*. This led to the proliferation of terms such as ‘multiculturalism’ and ‘plurality’ to characterise medieval Iberian societies (Wacks 1007, 10).

A more critical approach followed, demonstrating the treatment of minorities under Christian rule in Iberia was similar to other regions of Europe, represented by a spectrum ranging from tolerance to persecution (Dodds



1990; Glick 1992; Mann *et al.* 1992; Dodds *et al.* 2008). Post-colonial perspectives highlighted the role of uneven power relations between Muslims, Christians and Jews, demonstrating how multi-faith coexistence was subordinated to the dominant religion, whether Islam or Christianity (Soifer 2009). Following the expansion of the northern kingdoms into Andalusi lands, Christian writers depicted their society as a harmonious multi-faith triad. Indeed, several monarchs sought to promote the unity of their realms in this way, such as the Castilian king Alfonso VII, who in 1150 referred to himself as the ruler of the three religions. Perhaps the most widely cited example of *convivencia* is the tomb of Fernando III (d. 1252) in the cathedral (former mosque) of Seville. Built by his successor Alfonso X, it bears the same inscription in Latin, Castilian, Arabic and Hebrew.

Notions of tolerance are most evident in such literary and artistic sources, but these have been reinterpreted as part of a colonising agenda of cultural subordination (Liuzzo Scorpo 2011). For example, a recent reading of Fernando's funerary monument places it in the context of the monarchical performance of power to the 'conquered subject' (Prado-Vilar 2005, 79–80). Contradictions and inconsistencies are visible at the highest levels of Christian frontier culture, where opposition to Islam existed alongside affinity with, and appropriation of, Andalusi culture (Linehan 2001, 53; Wacks 2007, 15). It is evident that Christian patrons, especially clergy, valued Mudejar artisanship in masonry, carpentry, ceramics, metalwork and textiles (Ecker 2004). Recent work has also emphasised the crossing of interfaith boundaries did not necessarily result in a mutual understanding, but retained a sense of 'otherness' (Roser 2008). Regional and diachronic studies have, in turn, demonstrated the lived experience of Muslims and Jews living under Christian rule varied from place to place, and over time.

As outlined above, religious essentialist categories were already becoming adopted in the 12th and 13th centuries. The pontificates of Alexander III and Innocent III sought to draw clear lines between Christians, Muslims and Jews (the latter two groups commonly linked in ecclesiastical legislation). The Fourth Lateran Council in 1215 notoriously laid down regulations for Jews and Muslims to wear an identifying badge, with the aim of visibly segregating communities (Powell 1990, 188–191). This would be followed up by local variants; in 1252 the *cortes* (assembly) of Seville banned Muslims living in Christian towns from wearing specific colours and shoes, and obliged them to style their hair a certain way. In 1261, the same *cortes* added Muslim men should wear long beards. But there were limited efforts to convert them. In 1265, Pope Clement IV noted the reluctance of Christian kings to eliminate non-Christians from their midst, referring to the policies of Alfonso X of Castile (Linehan 2001, 39).

In the 14th century, there was increasing violence against Muslim and Jews, as well as increasing resistance to Islamic and Jewish cultural influences (Glick 2005, 294). In 1391–1415, amidst a spate of pogroms across Iberia many Jews converted and became 'New Christians' or *conversos*. The same occurred in Granada within a few decades of its conquest in 1492, resulting in the transformation of Andalusi Muslims into 'Christian' Moriscos. Any semblance of coexistence with deference to Islam and Judaism became replaced with the drive for cultural homogeneity.

Whilst there has been a scholarly backlash against the mythologising of al-Andalus and Christian Iberia as a harmonious multicultural utopia (Fernández-Morera 2016), the term *convivencia* and its academic synonyms 'pluralism' and 'multiculturalism' remain a focal point of historical research into constructions of difference in medieval Iberia (García Sanjuán 2003; Zoraghi 2012; Vakil 2021, 28–29). Its international currency remains popular, and it has become adopted to describe cultural encounters in other frontier regions, such as Hungary (Berend 2001), the southern Baltic (Naum 2013) and for medieval Christian-Jewish relations (Elukin 2013). But medieval Iberia's role as Europe's exceptional cultural crucible, particularly promoted in early Spanish historiography, has been largely rejected with the growing awareness of numerous multi-cultural frontiers across medieval Europe (Bartlett 1993). David Wacks (2007, 5) introduced the alternative term *contravivencia* (counter experience) for analysing interfaith relations. This was defined as a symbiotic, agonistic relationship between the different inhabitants of medieval Iberia 'in which each participant is a *sine qua non* in the construction of the other's identity and cultural formation'. This has had only limited impact within Anglophone scholarship, although the sense of a creative dialogue between contrasting cultures in the development of art and architecture had been framed earlier by Jerrilynn Dodd (1990). Discussions of constructions of race and categories such as *mestizaje* (mixed race) have been largely confined to a small number of Anglophone historians (e.g. Patton 2015), with Iberian scholars typically distancing themselves from what they consider to be the projection of modern racial histories (Nirenberg 2009, 245).

In this study, we engage with the concept of *convivencia* by analysing a range of diachronic trends associated with multiple ethno-religious communities in contrasting frontier regions. Central to this is an understanding of power relations and the cultural resilience of minorities. The results will be contextualised through comparisons with group dynamics in other frontier regions. Methodologically this is challenging, particularly in relation to material culture, and requires an interdisciplinary approach (see Chapter 2).

## The frontier of medieval Occitania

### *Frontier historiography*

Medieval Occitania has been extensively studied by French, Catalan and Anglophone scholars, particularly in relation to the Albigensian Crusade and Catharism (e.g. CEC 1949–2018; CF 1966–2019; Duvernoy 1979; Patterson 1993, 2023; Roquebert and Gimenez 2004; Biget 2020a). The impact of the incorporation of the region into Capetian France has also generated a substantial body of scholarship by historians, art-historians and archaeologists, focusing on a range of themes from fortifications to urbanism. Traditionally, French historiography on the frontier aligned it with national history and the borders of the state, defined by treaties and cartographic records. Interest in frontier research amongst French historians increased from 1986, during the third enlargement of the EU when national borders became more permeable, including the Pyrenean border between Spain and France. As with other studies of medieval frontiers, spatial case studies (e.g. Baron-Yelles *et al.* 2016) have been paralleled by exploring borderlands in the context of plurality, mobility and the agency of their social actors (Dauphant 2020). In this respect, the influential studies of Montailou by Emmanuel Le Roy Ladurie (1975) and Weis (2000) demonstrated how divergent belief systems could flourish at the frontier. Historians have also examined the role of the local nobility in the administration of the Pyrenean border, largely in the post-medieval period when borderland struggles over the control of resources (particularly timber and iron) intensified (e.g. Sales 1984; Poujade 2017). The most detailed study of the border has focused on its redefinition from the 17th century (Sahlins 1989).

The archaeology of the medieval Pyrenean frontier has been dominated by the study of fortifications, particularly *castra* (fortified settlements) and castles (e.g. Cazes *et al.* 2004). In the 1990s, a multidisciplinary project directed by Lucien Bayrou (1994, 1996) inventoried the castles, towers, fortified churches, urban defences and other fortified settlements on both sides of the French-Aragonese frontier. This included topographic and architectural surveys (Alessandri and Bayrou 1991). Bayrou (e.g. 2004, 2019) has continued to publish detailed reports and comparative studies of these fortifications, demonstrating the scale of investment in their construction in both French and Aragonese territories (Puig and Bayrou 2023). The most iconic monuments have been the focus of sustained research (Fig. 1.6). Archaeological investigations at Montségur from the 1960s onwards have been able to identify three phases associated with the French takeover: the fortified settlement from the first half of the 13th century, traces of the 1243–1244 siege and the subsequent construction of the castle in the second half of the 13th century by a royal architect for the French Lord Guy II of

Lévis. Montségur became the centre of the frontier lordship of Mirepoix and formed part of the defensive line running along the border (Barthet and Sabatier 2019).

Archaeologists have also focused on settlement classification and morphology (e.g. Grau and Poisson 1987; Berthe and Benoît 2001; Catafau 2015), including in relation to the long-term impact of the French annexation of Occitania (Brenon and Dieulafait 2001) and the chronology of rural desertion (see below). Ecofacts have been recovered from a number of frontier sites, and these have contributed to region-wide surveys (e.g. Durand *et al.* 1997; Forest 1997; Bouby *et al.* 2005). Resource exploitation, particularly mining (e.g. Izard 1994; Catafau 2005) and pastoralism (e.g. Rendu 2003), have also attracted attention from historians and archaeologists. The impact of French annexation has been assessed through case studies and situated within broader diachronic trends (Bailly-Maître and Gardel 2007). The role of climate change in Occitania, particularly the end of the Medieval Climatic Anomaly, which coincides with regime change in the 13th century, has also been the focus of multidisciplinary research (Carozza and Puig 2011). Finally, a significant body of scholarship on the frontier has been produced by Catalan scholars, particularly influenced by French research on Occitan rural settlement (Bolòs 2010). A collaboration between the University of Toulouse II, the University of Zaragoza and the Autonomous University of Barcelona resulted in the most recent compendia of studies covering a range of themes relating to the medieval Pyrenean frontier (Gasc *et al.* 2018).

### *Events shaping the Occitan frontier*

The gradual disintegration of Carolingian royal authority in the Spanish March saw the transformation of marcher lordships into independent polities. South of the Pyrenees, a union between the ruling dynasties of Barcelona and Aragón in the mid-12th century established the Kingdom of Aragón, whose monarchs came to wield power and influence across the Pyrenees as far north as Gévaudan. North of the Pyrenees, the region referred to as Occitania in Latin, Languedoc in French, characterised by its distinctive language (Lafont 2004), became defined by a patchwork of smaller territories (Fig. 1.7). The relationship between these different polities was characterised by a complex mixture of shifting allegiances, endemic warfare and territorial disputes. By the turn of the 13th century, the most powerful lord in Occitania was Count Raymond VI of Toulouse (1194–1222), who claimed overlordship over a number of counties and duchies. His marriage to Eleanor of Aragón in 1203 resulted in the addition of the counties of Millau, Gévaudan and shared lordship over the county of Forcalquier. Raymond was at one point the vassal of the French king, at another of the Aragonese king. Nonetheless, the various Occitan lordships essentially operated as autonomous or semi-autonomous polities, with no rigid hierarchy in place.





Fig. 1.6. The castle at Montségur, Ariège department, France (MDanis, Wikimedia Commons)





Whilst the largest territories of Foix and Béziers-Carcassonne were controlled by aristocratic dynasties from key urban centres, a number were governed by minor noble families ruling over relatively small districts and dependent on others through vassalage or kinship. These had formed over the course of the 12th century when a process of *incastellamento* was evident in the landscape with the construction of *castra*. These consisted of elite residences which overlooked and symbolically dominated villages situated alongside them (Baudreu 2004), and can be connected with the process of feudalisation which began across the Pyrenees in Catalonia in the early 11th century (Bonnassie 1994). By the 13th century, Occitania's towns had become wealthy through trade and their patricians strove for self-governance, challenging the authority of both the landed nobility and the Church. The region's fragmented political makeup facilitated a culture of anticlerical sentiment and alternative belief systems, which would come to be branded by the Church as Catharism (Léglu *et al.* 2014, 1–3).

Cathars were a dualist sect, disputing the fundamental teachings of the Church, including the sacraments, and even the validity of the institution itself. They had their own religious organisation which was embedded within the fabric of Occitan society. When efforts to suppress the heresy through preaching failed, Pope Innocent III called a crusade in 1208 against the Cathars and those nobles who supported them. This began the following year, and was the first of a series of brutal military campaigns and massacres led by predominantly French armies, collectively referred to (from the early 19th century) as the Albigensian Crusade (Fig. 1.8). The crusaders targeted the lordships in the region which supported Catharism, confiscating their lands. As a result, this became a war of conquest where the French crown would wrest control over Occitania from the rulers of Aragón. A temporary peace was organised in 1229, but more lasting political changes came with the Treaty of Corbeil in 1258 (Claramunt Rodríguez 2004). Louis IX renounced his sovereignty over Barcelona and Roussillon (as Carolingian successor), and James I of Aragón withdrew his claim on the Fenouillèdes, Peyrepertuse, the counties of Toulouse and Saint-Gilles, Quercy, and a host of vicounties including Gévaudan and Provence. The Val d'Aran (diocese of Comminges) and Capcir (diocese of Narbonne, later Alet), both north of the Pyrenees, remained in the Crown of Aragón. At this point, the mountains became a new borderland between the kingdoms of France and Aragón (Sahlins 1989). Governance of the frontier was delegated to a number of French and Catalan lordships, which developed familial ties and rivalries. The county of Toulouse would be officially incorporated into the kingdom of France in 1271, when its last ruler died without issue. The counts of Foix, on the other hand, strove to maintain their independence and opposed both the French and Aragonese crown when it suited them. Their family held lands on both sides of the

Pyrenees, and sponsored the construction of a number of castles (Guillot 2005–2006). The evidence from charters indicates these castles came to define the articulation of power at the frontier (Guillot 2017, 57).

The culture of religious policing in Occitania originated with papal aspirations to suppress Catharism, following the military successes of the Albigensian Crusade (Biget 2014; Paul 2019). The activities of inquisitors were influenced by relations between the papacy and the French crown. In the 1290s, King Philip IV, who was in conflict with Pope Boniface VIII, limited its funding and severely restricted its activities. However, after visiting southern France in 1303, he became alarmed by the anti-monarchical sentiments of the people in the region, especially in Carcassonne, and decided to remove the restrictions placed on inquisitors. The final assault on Catharism was led by Dominican Bernard Gui, Inquisitor of Toulouse from 1308 to 1323. By the mid-14th century, Catharism had been suppressed in Occitania.

The Albigensian Crusade and its aftermath left a lasting and complicated relationship between Occitania and 'the north' of France. On the one hand, French political structures were introduced and inquisitors were given free rein to suppress what was left of Catharism; their activities also an expression of the power of the new regime (Moore 2012; Biget 2020b). On the other hand, Occitan continued to be used as the language of local government and many pre-Crusade institutions and legal customs remained in place (Gardner 2006). The memory of the Crusade was revived with the emergence of Occitan nationalism in the 19th century (Lafont 2004). The Occitanist movement remained active throughout the 20th century and contributed to the amalgamation of Languedoc-Roussillon and Midi-Pyrénées as Occitanie in 2016 (Costa and Brennan 2021).

### ***Territorial reorganisation under French rule***

The Albigensian Crusade resulted in the confiscation of small Occitan lordships and their merger into larger territories. The initial beneficiary of these was Simon de Montfort, and his seizure of land was validated by the Fourth Lateran Council in 1215. Having failed to win over the local nobility, Montfort installed some twenty friendly vassals, mostly French knights, in the seized Occitan castles. Administrative functions were given to *sénéchaux* (seneschals) who governed *sénéchaussées* (seneschalties) and the consolidation of the new estates prompted episodes of rural settlement reorganisation. Where the population was too dispersed, they were moved to newly established villages, resulting in the abandonment of some hamlets. With Montfort's death in 1218, the estates were recovered following an uprising by the Occitan nobility, although the Church also benefited from this redistribution of power. In 1224, Montfort's successor transferred his rights to the





region to the French king Louis VIII, and some of the former French vassals returned with the royal crusading army. In 1229, the Treaty of Paris imposed a new administration on the Trencavel lands, whilst the count of Toulouse kept a large part of his lands and even obtained some territories from the Carcassonne-Béziers viscounty. Earlier donations of land were annulled, except for that given to the bishop of Toulouse. In the lands of the Trencavels, a number of Montfort's former vassals were able to regain their estates, and some 25 noble families involved in the crusade established themselves in the region. They invested in the construction or upgrade of their castles, creating a new political landscape and consolidating the authority of the French crown. A small number of planned settlements (*bastides*) also began to be constructed, sometimes following the dispersal of a castral village. The earliest was established by the Count of Toulouse, and following a clause in the 1229 treaty, it was unfortified. In the Aude region, *bastides* were founded in the second half of the 13th century by the new stratum of noble families or by the French crown (Baudreau 2004).

The new administration retained the system of *vigueries* set up by the Trencavels in the 12th century, which organised judicial, military and administrative functions. Some of Montfort's seneschals became royal office holders. Whilst the new administration was initially dominated by French appointees, Occitan patricians also became office holders, particularly bailiffs. Following Raymond II Trencavel's rebellion in 1240 and Raymond VII's in 1242, the confiscation of fiefdoms by the French crown was accompanied by the demolition of some *castra* and the forced relocation of their communities. This was largely focused on the Carcassés and in parts of the Corbières and Minervois regions (Raynaud 1986, 459). In 1255, the French king ordered the destruction of the castle of Niort; the adjoining castral village would later be abandoned (Raynaud 1986).

In 1247, the seneschals of Carcassonne and Béziers were merged and new *vigueries* were established in the following years which strengthened royal jurisdiction (Friedlander 1982) (Fig. 1.9). The designation of the frontier in 1258 prompted strategic investment in a series of castles which controlled the routes through the Pyrenees. Indeed, the term *frontière* first appeared in French documents in the 13th century referring exclusively to military usage, only later adopting a geopolitical meaning (Constable 2006, 1; see also Catala *et al.* 2011). The castles of Aguilar, Puylaurens, Peyrepertuse, Quéribus and Termes were designated as strategic fortifications and housed royal French garrisons (Helas 2005). Royal castellans, largely former crusaders, were appointed to govern these castles, which served as both military centres and symbols of the new regime. Some castles became connected with the exploitation of specific economic resources. For example, the office of castellan of

Tours de Cabardès was created to govern the mining district previously associated with the *castrum* of Cabaret. Indeed, it has been argued that gaining control over the exploitation of natural resources was a major driver in the confiscation of Occitan territories (Débax *et al.* 2007, 29–30). Further administrative changes sought to strengthen royal authority at the frontier. In 1262 a royal commission investigated the lands of the Occitan lord Pierre de Fenouilledes, with the result that a new *viguerie* was created, first mentioned two years later to which the district of le Termenès was attached. Later the frontier district of Pays de Sault would be created, governed by a royal bailiff from 1288.

The redefinition of the frontier in 1258 also appears to have had an immediate impact on some settlements. For example, the *castrum* of Casteldos (Bousquet commune) had belonged to the Sauton family who were vassals of the king of Aragón. The Sautons were investigated by inquisitors for their heretical beliefs on behalf of the king, after which their *castrum* was confiscated. After 1258, the property ended up in French territory. At this point it ceased to play a role in the governance of the frontier, a strategic decision by the French regime, and the castral village was eventually abandoned. The nearby settlement of Bousquet was established in c. 1286 with settlers from Soumayrac and most likely the remaining population of Casteldos (Raynaud 1986). But archaeological chronologies of rural settlements have demonstrated that not all episodes of desertion can be linked to the impact of the new regime. There appears to have been a demographic collapse in the eastern Pyrenees during the second half of the 14th century, with an estimated 70% reduction in the population. This has been connected to the impact of plague, famine and conflict, and corresponds to a wave of village desertion as survivors relocated to larger settlements. This was exacerbated by the outbreak of war between France and Aragón in 1473, which saw large numbers of livestock plundered from Pyrenean communities (Raynaud 1986, 463–464; Bolòs 2009, 32).

Occitania provides a case study of frontier dynamics between neighbouring Christian polities. It transforms from a series of fluctuating internal borderlands between competing territories to a stable frontier between two major Catholic powers that endures for four centuries. This process is driven by the mechanism of crusade, which is followed by a period of religious policing. Both political and religious actions impacted on the cultural landscape.

## Research questions and structure

The comparative study of frontier societies in medieval Iberia and Occitania, created by episodes of conquest and regime change, is presented in this book through a series of thematic chapters, organised by region. The regions have

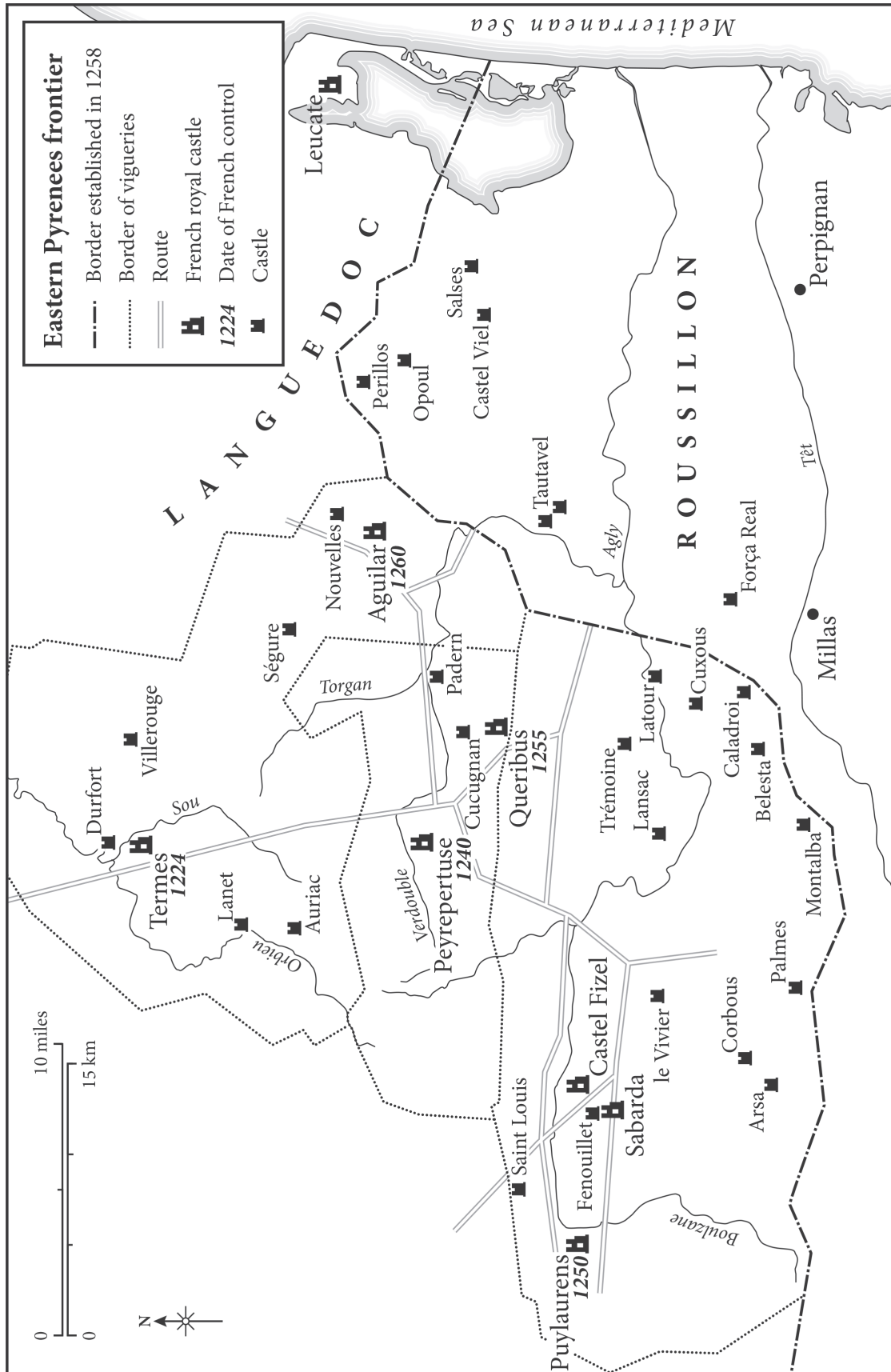


Fig. 1.9. Map showing the Seneschalty of Carcassonne-Béziers and its vigueries with the French-Aragonese border as defined in the Treaty of Corbeil

been chosen to represent a range of frontier dynamics, although all were associated with state expansion and framed in the rhetoric of ethno-religious hostilities. They are not geographically contiguous, but all were part of Umayyad al-Andalus and subsequently shaped by the expansion of Christian polities. Nonetheless, the inclusion of Occitania was also intended to provide a further contrast to the Iberian Christian-Muslim frontier regions, by examining a major, lasting Christian-Christian frontier. The thematic chapters are integrated through regional and inter-regional discussions that address four key research questions:

1. How was the political landscape of the frontier shaped?
2. How is the frontier reflected in long-term changes in settlement and social organisation?
3. What impact did the creation of a frontier have on environmental exploitation?
4. How resilient were frontier societies following conquests and the imposition of new regimes?

The chapters have been organised in a way to make them accessible to specialists, culminating in a synthetic discussion which will address the research questions outlined above.

## Abbreviations

CEC Cahiers d'Études Cathares

CF Cahiers de Fanjeaux

## Note

- 1 <http://www.castillosdeespaña.es>

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# Studying frontier societies: Theory, scales, methods and chronology

*Aleksander Pluskowski, Guillermo García-Contreras  
and Michelle Alexander*

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## **Introduction: Investigating frontiers in the medieval western Mediterranean**

This chapter outlines the scales of analysis, range of techniques and theoretical framework used within the study, the results of which are presented in subsequent thematic chapters. There are several challenges associated with the interdisciplinary investigation of medieval frontier societies – both methodological and theoretical. Historical and archaeological sources relating to any given region are both highly fragmented and unevenly represented in time and space, and require the integration of multiple sources to reconstruct and contextualise long-term trends in discrete territories. The data gathered for this study has come from targeted excavations, archives, landscape investigations and documentation of standing buildings. An important challenge is represented by the identification of ethno-religious groups on the basis of material culture. Again, multiple lines of evidence are required to avoid falling back on simple essentialist categories of difference. Related to this is the need for robust chronologies, developed from combining the data from the written record with absolute and relative dating of archaeological and palaeoenvironmental data. Finally, a common interpretative framework enabling meaningful comparison between case study regions requires the use of appropriate theoretical tools. These are outlined at the end and inform the synthesis of results for each region, and for the inter-regional discussion which concludes this study.

## **Scales of analysis**

This study uses three scales of analysis for aggregating multi-disciplinary data. The first is defined as ‘the site’, consisting of different types of settlements with multiple phases of occupation. The second is ‘the territory’, which

refers to historically discrete political units such as lordships, where the cultural landscape can be mapped in terms of settlement, communications and land use. In early al-Andalus and pre-Crusade Occitania these are not always so clearly spatially defined, and can only be outlined in the landscape at a relatively coarse resolution, if at all. The third is ‘the region’ which corresponds to broader, contiguous landscapes defined by the historical frontier and enables comparisons between territories.

## **Sites**

Archaeological sites chosen for this project consisted of castles (fortified structures, which included communal structures, private residences and fortified villages or *castra*), urban and rural settlements, whilst all types of settlement and infrastructure (including mines and saltworks) were included in broader landscape surveys. There were three categories of site. The first were chosen following earlier pilot projects which involved geophysical survey and evaluation of their buried deposits. These were the focus of targeted excavations with consistent methodologies and sampling strategies. The second were the focus of either rescue excavations or separate research projects, where it was possible to collaborate to obtain at least one or more types of data. A consistent sampling strategy for plant remains and soil blocks was employed following discussions with site directors. The third were previously excavated sites where access was granted to archival materials for further recording and/or sub-sampling. In this latter case, both the archaeological methodologies used and the available contextual information varied the most.

As a result, this study drew on data from a range of excavations, both recent and historical, which followed a variety of recording systems and methods of digging. They



Fig. 2.1. Map showing locations (provinces and departments) of regions in Spain and France from where data was collected for this study

ranged in scale from small trenches, sondages and test pits to large, open areas of entire structures and connected spaces. A number of sites, particularly castles, also included standing remains with varying levels of preservation and phases of modification. The quality of the data varied as a result, and this issue is addressed within the individual specialist chapters. The location of all the case study regions included within this volume is shown in Fig. 2.1.

### ***Territories***

The territories associated with key project sites have been defined in relation to historical propriety and/or jurisdiction. The Andalusí *hisn* in Molina de Aragón and the *medina* of Atienza were associated with territories of the Banu Azzun and Banu Salim, then with the taifas of Molina and Toledo. With the conquest of Atienza and its

transformation into a royal Castilian district, Molina's territory became associated with the Banu Dil-Nun. Following the Aragonese conquest it was transformed into a lordship that would become largely autonomous under the rule of the Lara family. The boundaries of the Andalusí territories are not clearly defined, whilst the post-Christian conquest territories are described in written sources. In western Catalonia, the *hisn* and later *medina* of Balaguer came under the control of the Banu Qasi, then the Banu Tujib who would establish the Taifa of Zaragoza and finally the Banu Hud in the 11th century. Following its conquest in 1105, the re-founded town became part of the County of Urgell and developed a new patrimony. In 1418, the county was annexed by the Crown of Aragón and a new lordship of Balaguer was established. In Andalusia, the *hisn* of Moclin and the *medina* of Cártama became integral to the



security of the frontier of the Nasrid emirate from the 13th century. Cártama was conquered by Castilian forces in 1485; Moclin in 1486. The sites within the modern urban area of Granada were conquered in 1492. Their associated territories during the Nasrid period are more clearly defined, and these were reorganised following the Castilian conquest. In the eastern Pyrenees, the castle of Fenouillet was assigned its own *viguerie* in the 12th century, which was reorganised in 1262 by the French royal commission and included the district of le Termenès. The castle of Les Angles and the village of Vallsera were part of the property of the abbey of Saint Michel de Cuixa in the 10th century, within the County of Barcelona. From 1258, the castle and its lands were transferred to the Crown of Aragón. In many of these cases, the territorial boundaries of the smallest political units associated with these sites are difficult to reconstruct due to the lack of evidence. Indeed, they may not have been clearly defined and the spaces between them and other centres of power may have been contested. The specific challenges of each territory are addressed in the regional chapters.

### Regions

The territories outlined above were, for the most part, fragments of larger polities. In Guadalajara, the taifas of Toledo and Molina were replaced by the lordship of Molina, whilst its western neighbours were *comunidades de villa y tierra*, episcopal lands and fiefs assigned to military orders by Castilian rulers. They were all situated within the expanding kingdom of Castile. In western Catalonia, the *medina* of Balaguer lay within the Taifa of Zaragoza by the 11th century. This was replaced by the County of Urgell, which was subsumed into Aragón in the 15th century. In Andalusia, the Nasrid emirate was annexed by the kingdom of Castile in 1492. In the eastern Pyrenees the Viscounty of Carcassonne was replaced by the *sénéchaussée* of Carcassonne and Béziers, and became part of the French kingdom. Additional data from these larger regions is included for the purposes of contextualising the smaller case study territories.

### On- and off-site analyses

The study's methodology involved analysis of occupation deposits within the bounds of archaeological sites (on-site) and in their associated territories (off-site). On-site analyses focused on a range of artefacts (ceramics, metals) and eco-facts (animal bone, plant remains) to provide indicators of chronology, site function and relationship with their broader landscape (Figs 2.2, 2.3). They also included recording and sampling standing buildings for determining chronology, construction techniques and fabric analyses. Off-site analyses focused on discrete areas of agrarian spaces (irrigated fields and channels, terraces), depositional basins (lakes)

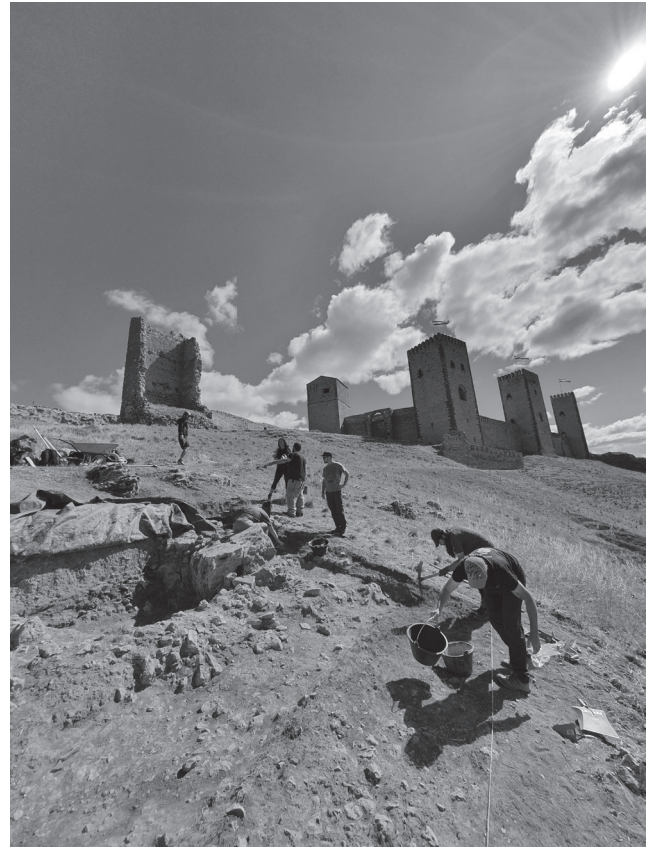


Fig. 2.2. Excavations in the castle of Molina de Aragón

and individual structures (towers) within the historically defined territories associated with frontiers (Figs 2.4, 2.5).

## Methods and data

### Historical sources

#### Iberia

Historical sources provided both the essential framework for reconstructing frontier territories and specific details relating to their governance, social organisation and the lived experiences of their communities. Two types of historical sources were used: documentary and literary, written in Arabic, Latin, Hebrew and Romance (i.e. vernacular Castilian, Catalan, Occitan and French). Comparatively few documentary sources are available for Andalusi societies compared to Latin Christian ones, partly due to contrasting attitudes to the preservation of bureaucratic documents and the importance attached to codifying privileges in the latter. In the majority of cases, Andalusi documents were copies or translations produced by Christian writers. Literary sources include chronicles, geographies, agronomic and legal texts, although their coverage of al-Andalus is uneven; for example, the east (*Sharq*) is rarely mentioned (Torró 2012, 12). The earliest history of al-Andalus is attributed to the





Fig. 2.3. Excavations in the castle of Atienza

Cordoban Aḥmad al-Rāzī, with Ibn Ḥayyān's *Al-Muqtabis fi Tarikh al-Andalus* and *Kitab al-Matin* providing the main source on the Umayyad period. With the incorporation of al-Andalus into the Almoravid and Almohad empires, further details about the movement of Iberian frontiers are documented in the works of Ibn Bassām and the *Kitāb al-Jughrāfiyya* of Muḥammad ibn Abi Bakr al-Zuhri. During the Nasrid period, a new literary genre developed which mourned the loss of al-Andalus to the Christian kingdoms. This saw the production of local histories that sought to preserve the region's memory. The most important historian of 14th-century Granada was Ibn al-Khatib, whose numerous works included histories and geographies of the city and region. Finally, the *Dhikr bilād al-Andalus* written in the late 15th century by an unknown Maghrabi author includes the geography of the Iberian Peninsula and the history of al-Andalus (de Castro León 2020). The transliteration of Arabic words follows the style of *Al-Qanṭara*.

The reorganisation of territory and the governance of different frontiers following the Christian conquests,

produced increasingly larger quantities of documentary sources over time. They include *fueros* from the 12th century and *Libros de Repartimiento* for a number of towns and regions between the 13th and 15th centuries. Historical events relating to the frontier are well known from a series of chronicles produced by Christian authors. For Castile, these are *Anales toledanos* which include the first annals written in Castilian; *Anales castellanos segundos*; *Chronica latina regum Castellae*; *Chronica Adefonsi imperatoris*; *Crónica de Alfonso III*; *Crónica de Fernando III*; *Crónica General de 1344* attributed to Alfonso XI of Castile and *Crónica de la Conquista de Granada*. The epic poem *Cantar de Mio Cid* is a retrospective of the life and exploits of Rodrigo Díaz de Vivar (c. 1043–1099), but also contains valuable insights into the frontier societies of 11th-century central and eastern Iberia. It is probably the best known of the Iberian frontier ballads – *romance fronterizo* – which describe multi-faith encounters across the borderlands. Other vernacular poems such as *Libro de Buen Amor* provide invaluable insights into the construction of





Fig. 2.4. Excavating the terrace system on the slopes around the castle of Molina de Aragón



Fig. 2.5. Coring the lake at Tordesilos, Guadalajara province

the Andalusí other, and perceptions of multi-faith relations under Christian rule (Hamilton 2007).

### *Occitania*

The region of Occitania has not only produced the largest body of medieval French literature, but also saw the first use of the Romance vernacular in Europe. Occitan poetry developed in the 11th century; between the mid-12th and mid-13th century, its dominant form was the *chanson de geste* or epic narrative poem composed in verse. At this time, Occitan lyrical poetry became famously associated with the troubadours. These provide some of the key sources for the events of the Albigensian Crusade, particularly Guillaume de Tudèle's *Chanson de la Croisade contre les Albigeois*. The two main contemporary histories for the Crusade are the *Historia Albigensis* of Pierre des Vaux-de-Cernai and the *Chronique de la Croisade des Albigeois* by Guillaume de Puylaurens, alongside papal correspondence (Léglu *et al.* 2014). Subsequently, the French royal administration generated increasing numbers of documents relating to the governance of its Pyrenean frontier territories. There is also a substantial number of inquisitorial documents relating to the interrogation and

prosecution of heretics in Occitania in the 13th and 14th centuries (Given 1997; Biller *et al.* 2010; Sparks 2014; Arnold and Biller 2016). These provided the basis for Le Roy Ladurie's (1975) *Montaillou*, which presented multiple facets of life on the frontier.

### *Artistic sources*

Artistic sources provide complementary data on different lived experiences of the frontier societies of medieval Iberia and Occitania. In the case of the former, together with architecture, they represent one of the most important bodies of evidence for understanding multi-faith relations. The Iberian and Anglophone scholarship on *mudejārismo*, including architecture and art, is vast (e.g. Dodds 1992a; Borrás Gualis 2010; Ruiz Souza 2012; Castro Royo 2016), and there have also been studies of late medieval Sephardic art, primarily based on manuscript illustrations (e.g. Kogman-Appel 2004), but also architecture (e.g. Dodds 1992b; López Alvarez and Izquierdo Benito 2001). For the case study regions included in this book, surveys of Mudejar architecture and art have been carried out for Guadalajara (e.g. Sánchez Castro 1985; Clemente San Roman and García López 2007; Pradillo Esteban 2007), Andalusia (e.g. López Guzmán 2021) and western

Catalonia (e.g. Cabañero Subiza 2010). Christian art in Iberia has also been extensively studied, as elsewhere in Europe, and often in relation to the notion of *convivencia* (e.g. Mann 2010). In Occitania, Romanesque and Gothic architecture has also been the focus of several studies, particularly in exploring southern creative responses to the importation of the northern French Gothic style (Vivian 1988; Bonnerly 1990, 1995; Vicaire 1993; Bond 1994). Artistic influences across the Pyrenean frontier have also been considered (e.g. Garcia Lasheras 2014).

### Remote sensing

Topographic models for case study sites and territories were created using available Lidar data and additional cartographic sources, which for specific sites was combined with geophysical surveys. Two national Lidar surveys were carried out in Spain by the *Instituto Geográfico Nacional*, the first from 2008–2015, the second at a higher resolution from 2015–2021.<sup>1</sup> A national Lidar survey is being carried out in France by the *Institut national de l'information géographique et forestière*, due to be completed by 2026. Elevation data from the eastern Pyrenees is already available.<sup>2</sup>

Geophysical work in Iberia was conducted by Robert Fry and David Thornley (Reading) (Fig. 2.6). The aim of these surveys was to identify areas that would be suitable for siting an archaeological excavation with a view to finding undisturbed anthropogenic deposits (García-Contreras *et al.* 2023). Two types of equipment were used: a Bartington Grad 601–2 dual fluxgate gradiometer and a Ground Penetrating Radar (GPR). The choice of equipment was dictated by the type and condition of soils, the gradients of slopes, as well as the compositional range of buried materials. The data was processed to produce magnetic contrast maps from the gradiometer surveys, and radargrams from the GPR, which highlighted the position of buried archaeological features, including the remains of buildings, ditches, pits and metals. This data informed the positioning of small-scale trenches, which targeted areas inside and outside buildings to maximise the collection of artefacts and ecofacts, as well as characterise spatial functions (García-Contreras *et al.* 2023). In some, but not all cases, excavations confirmed the findings of the geophysical surveys, illustrating the limitations of these techniques in particular soil conditions.

### Archaeological sources

Following geophysical survey, a number of trenches were opened within specific areas of the case study sites. These were located with the aim of uncovering intact occupation deposits and to maximise the recovery of ecofacts (plant remains, animal bones and related products, as well as geochemical traces of human and animal activities in the soil) and artefacts. Summaries are provided in the introductions to the sites in the later chapters of this book. Off-site archaeological sources consisted of material culture obtained

through field walking (and drew on earlier surveys conducted by García-Contreras), small-scale excavations and documented landscape features, including earthworks and known archaeological sites. These provided essential data for mapping the distribution and chronology of settlement, as well as insights into the function of land use.

### Artefacts

A diverse range of artefacts were recovered from sites included within the project. The most abundant were ceramics fragments, which are routinely used for relative dating (see below). Ceramics are also used in medieval Iberian archaeology for identifying ethno-religious groups. Whilst a strong connection between migration and material culture has been critiqued for early medieval north-western Iberia (Serrano Herrero *et al.* 2016), changes in the type of ceramics and the organisation of their production have been compellingly demonstrated across those regions of Iberia which experienced waves of migration throughout the medieval period (Carvajal López 2019). Transitions in ceramics following episodes of Christian conquest are understood from a number of detailed case studies, which have connected the production and consumption of new material culture with distinct social identities. Changes in ceramics are evident following the Christian conquests in Portugal (Casimiro *et al.* 2018), where the gradual transition in forms and colours has been connected with the persistence of Andalusí pottery workshops increasingly producing for a Christian market, followed by later arrivals of migrating Christian potters. Similar changes have been identified from sites within the Nasrid emirate, with examples of continuity and change following the Castilian conquest reflecting variable shifts in production and consumer demand (Zapico and García Porras 2021). Short-term continuity has also been identified in Seville (Bridgman *et al.* 2010), which would become a major centre for ceramic production in the centuries following the Christian conquest. Shifts in ceramic consumption reflected changes in dining habits, from communal eating to individual servings. Andalusí *ataifor* plates were either repurposed as serving dishes or their production declined, whilst demand increased for smaller individual dishes and bowls. From the 13th century Andalusí artisans produced new lustre wares which utilised metallic glazing and multiple firings, used in other parts of the Islamic Mediterranean. The first major centre of production was Malaga which catered to the Nasrid elites as well as Christian consumers. This was followed by Valencia where potters decorated their products with a fusion of Muslim, Christian and Jewish motifs, which formed a cohesive aesthetic. This is referred to as Hispano-Moresque or Mudejar pottery. However, whilst chronological changes are readily visible and can be connected with specific workshops, it is not possible to identify the presence of minority groups like Jews and Mozarabs on the basis of





Fig. 2.6. Geophysical survey at the castle of Atienza

ceramic consumption alone. Recent studies have also begun to explore these technological changes through chemical compositional analyses of ceramic fabrics (e.g. Pérez-Arantegui and Marzo 2021; Valls Llorens *et al.* 2022).

In Pyrenean Occitania, there is no evident long-term disruption of local ceramic production as a result of the Albigensian Crusade. In fact, changes in the ceramic industry are best understood over the course of a longer timeframe: the 12th to mid-14th century. The diversification of forms, initially visible in urban areas, has been interpreted in alimentary terms, reflecting the dissemination of food products and culinary culture from neighbouring Catalonia (Lécuyer 1997). Imported Iberian ceramics from centres like Málaga and Valencia are also evident.

A study of select metal objects from excavations in Molina de Aragón was also carried out as part of Yaiza Hernández-Casas' doctoral thesis, in order to provide a detailed case study of the frontier dynamics of mining and metalworking. This included Lead Isotopes Analysis conducted by Inductively Coupled Plasma Mass Spectrometry (MC-ICP-MS) at the SGIker (UPV/EHU), in collaboration with the Molina–Alto Tajo Geopark.

### *Animal bones*

Animal bones represent one of the most abundant ecofacts recovered from archaeological contexts. Most assemblages are the end result of human depositional activities connected

with food preparation, consumption and manufacturing, although they do not reflect the actual number of animals present at the site or nearby environments. However, comparative analysis of assemblages can indicate the relative significance of individual species across multiple sites, and over time. This work builds on earlier studies of the impact of the Arab-Berber conquest on animal exploitation in Iberia, particularly in diet (e.g. García García 2019, 2022, 2023), and inter-regional studies of faunal assemblages in medieval Languedoc (e.g. Forest 1997; Forest and Rodet-Belarbi 2011). Faunal material was found during excavations of all the project's sites, and the sieving and flotation of targeted contexts enabled the recovery of bones from fish, small birds and micro-mammals. A number of assemblages from previous excavations in Spain and southern France, stored in regional museums, were also accessed for recording and sampling for isotopic analyses (Fig. 2.7). For Iberia, the methodological protocols and the quantification techniques used are outlined in detail in Chapter 7 and for Occitania in Chapter 14. Taphonomic variables including fragmentation were noted for the purposes of comparability, but were not the focus of analyses. Animal bone fragments were also sub-sampled for isotopic analyses (see below) and AMS dating. There was no scope within the project to carry out ancient DNA analyses, although this is suggested as a useful tool for future work, especially relating to livestock lineages, diversity and mobility.



Fig. 2.7. Map showing sites with faunal assemblages included in this study

### Isotopic analyses of bone

The analysis of stable isotopes has been successfully applied to archaeological bone with the aim of reconstructing dietary patterns and mobility. Isotopic studies of diet and mobility in medieval Iberia have been increasing over the last decade, many focusing on multi-faith communities (e.g. Alexander *et al.* 2015, 2019; Olivé-Busom and López-Costas 2024), but also on the northern Christian polities (Lubritto *et al.* 2017; MacKinnon *et al.* 2019; Pérez-Ramallo *et al.* 2022, 2023). There have also been isotopic studies of diet in medieval Languedoc (Mion 2019, 2021). Whilst many studies have focused on reconstructing past human diets, isotopic data extracted from the bones of mammals and fish is also shedding important light on exploitation and management strategies. Studies conducted within the framework of this project focused on sites within Guadalajara and the eastern

Pyrenees, primarily focused on stable isotopes of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) from mammalian livestock (mainly sheep, goat, pig, cattle) and humans. For specific sites and individuals, additional analyses included sulphur ( $\delta^{34}\text{S}$ ), oxygen ( $\delta^{18}\text{O}$ ) and strontium ( $^{87}\text{Sr}/^{86}\text{Sr}$ ) isotopes. Samples of plants were also collected from geologically contrasting areas within the province of Guadalajara and the Ariège, Aude and Pyrénées-Orientales departments to provide  $^{87}\text{Sr}/^{86}\text{Sr}$  isotopic baselines. Sample preparation and analysis for  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  were performed at the University of York. Sulphur isotopes were analysed at Iso-Analytical, while plant  $^{87}\text{Sr}/^{86}\text{Sr}$  isotopes were analysed at Vrije Universiteit Brussel in collaboration with Christophe Snoeck. Animal tooth  $\delta^{18}\text{O}$  and  $^{87}\text{Sr}/^{86}\text{Sr}$  analyses were conducted with Jane Evans at the British Geological Survey. The isotopic contribution to the present volume focuses on  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  analysis of humans,



mammals and fish from sites in the western area of Guadalajara (Fig. 2.8; see Chapter 8). Data from the remaining sites and other isotopic systems will feature in future publications.

### *Plant macrofossils*

The term plant macrofossil refers to the remains of plants visible with the naked eye, including seeds, fruits, nuts, husks, stems, mosses and charcoal. In archaeological contexts, assemblages of plant macrofossils typically include plants derived from local habitats and consist of those both intentionally and unintentionally transported to a site. The charred and uncharred remains of seeds and fruits are typically the most ubiquitous category of plant macrofossil recorded from archaeological sites. They represent a key source of data on the production and/or use of both cultivated

and wild plants for nutritional, medicinal or industrial purposes; evidence for trade, including the export of agricultural produce and the import of exotics; the role of food plants as indicators of social status; and for reconstructing the ecological conditions of a site and its surroundings. Although archaeobotanical work had been carried out on medieval sites in Iberia, this project contained the first such study conducted on a large, inter-regional scale (Fig. 2.9; see Chapter 6), and has been followed by further detailed regional studies (e.g. Ros *et al.* 2020). Unfortunately, due to the constraints of time and accessibility, it was not possible to include data from medieval sites in Occitanie.

Bulk samples for plant macrofossil analysis, of at least 10 liters volume, were taken from a range of occupation contexts revealed through excavation. This included deposits



Fig. 2.8 Map showing sites where isotopic analysis of human and animal remains was carried out for this study





Fig. 2.9. Map showing sites with plant macrofossil assemblages included in this study

from occupation surfaces and the fills of pits. Samples were processed either in the field or in the laboratory (Fig. 2.10). A consistent protocol was used which involved sieving the sediments by flotation through 2mm and 500µm meshes (Marinval 1999). The discovery of contexts with mineralised carpological remains resulted in sieving being carried out underwater using the same mesh gauges, but without flotation, as such remains do not float well. The extraction and identification of recovered seeds were carried out with the aid of a Nikon SMZ645 stereoscopic magnifying glass, with magnifications ranging from  $\times 6.5$  to  $\times 10$ . This was carried out in the laboratory of UMR 5554 (ISEM, Montpellier, France) using institutional, published and digital reference collections. Unfortunately, plant macrofossils were not preserved in all the sampled contexts, resulting in an uneven

representation of data from across the study's case study areas. As a result, these findings have been complemented by existing data from neighbouring sites and regions.

### *Phytoliths*

Phytoliths are plant microfossils that are formed of biogenic silica; as the plant grows it takes up silica from the soil and deposits it within its cell structure. When plant remains decay, phytoliths are left behind in the soil, and generally preserve well in archaeological deposits unless soils and sediments are highly alkaline, particularly around pH9 (Piperno 2006). Phytoliths can be particularly useful tools in archaeology to examine crop processing and animal husbandry activities (e.g. Harvey and Fuller 2005), as grasses in particular, when certain phytoliths such as conjoined



Fig. 2.10. Flotation of archaeological sediments in the field in Atienza

cells from the husk are present, can be identified to species (Rosen 1992; Twiss 1992), and  $C_3$  and  $C_4$  grasses can be differentiated between (Barboni *et al.* 1999; Twiss 1992). It is important not to over-interpret phytolith assemblages, and to apply the technique in conjunction with thin-section micromorphology to enable these microfossils to be studied in their depositional context (Shillito and Ryan 2013).

Loose sediment samples were processed using the following methodology: (1) the sample was screened through a 0.5mm mesh to remove coarse sized particles; (2) approximately 1gm of dried raw sediment was weighed out; (3) calcium carbonates were dissolved using a dilution of 10% hydrochloric acid and then washed in distilled water three times; (4) clay was removed using a settling procedure and sodium hexametaphosphate (Calgon) as a dispersant. Distilled water was added and the samples left for 75 minutes before pouring off the suspense. This was repeated at hourly intervals until the samples were clear. Samples were then transferred into crucibles and left to dry at a temperature of less than 50°C; (5) after drying, samples were placed in a muffle furnace for two hours at 500°C to remove organic matter; (6) phytoliths were then separated from the remaining material using a heavy liquid

calibrated to a specific gravity of 2.3. Phytoliths were transferred to centrifuge tubes and washed three times in distilled water. They were then placed in small Pyrex beakers and left to dry; (7) approximately two milligrams of phytoliths per sample were mounted onto microscope slides, using the mounting agent Entellan. Microscope slides were analysed using a Leica DMLP microscope with an attachable stage using  $\times 100$  and  $\times 400$  magnifications. A minimum of 300 single cells were identified and counted. The remainder of the slide was then scanned at  $\times 100$  magnification to identify any further multi-celled phytolith forms. Phytoliths were further classified as deriving either from woody (dicotyledon) or non-woody.

## Geoarchaeology

### Micromorphology

Micromorphology enables the *in situ* study of the sedimentary matrix of the depositional environment which is particularly useful for analysing the formation processes of archaeological deposits and the depositional context of micro-refuse for ascertaining use of settlement space. The technique has been widely applied to understand and interpret the use of settlement space in relation to activities inside and outside of buildings, and middening practices (e.g. Simpson *et al.* 2006; Milek and French 2007), the development of cultural landscapes (French 2003), and the reworking of archaeological stratigraphy by post-depositional processes (e.g. Gé *et al.* 1993; Macphail 1994; Canti 2003; French 2003, 123, 156; Macphail *et al.* 2003; Devos *et al.* 2009; Weiner 2010). Samples for micromorphological analysis were collected from profiles from a range of context types and features from sites in Spain in order to examine the development of occupation at the microscopic scale (Figs 2.11, 2.12).

Micromorphology samples were prepared in the Micro-analysis Unit at the University of Reading. The procedure followed is the standard protocol for thin section preparation (Murphy 1986). Samples were oven-dried at 40°C, and then impregnated with epoxy resin while under vacuum. Slides, 11.5cm  $\times$  7.5cm, were prepared to the standard geological thickness of 30  $\mu$ m. Micromorphological investigation was carried out using a Leica DMLP polarising microscope at magnifications of  $\times 40$ – $\times 630$  under Plane Polarised Light (PPL), Crossed Polarised Light (XPL) and Oblique Incident Light (OIL). Thin-section description was conducted using the identification and quantification criteria set out by Bullock *et al.* (1985) and Stoops (2003), with reference to Courty *et al.* (1989), to Mackenzie and Adams (1994) and Mackenzie and Guilford (1980) for rock and mineral identification, and Fitzpatrick (1993) for further identification of features such as clay coatings. Photomicrographs were taken using a Leica camera attached to the Leica DMLP microscope.



Fig. 2.11. Map showing sites sampled for micromorphological analysis for this study

### *Inorganic geochemistry*

Two methods of inorganic geochemical analysis have been used on sediment samples that have been collected from archaeological sites in Spain, X-Ray Fluorescence (XRF) and Inductively Coupled-Optical Emission Spectroscopy (ICP-OES). In order to investigate the link between sedimentation history and human impact, concentrations (ppm) were determined for eighteen elements using ICP-OES. Multi-elemental enrichment has been widely applied in archaeology to examine the use of settlement space and to identify specific activities such as metalworking and animal husbandry (Fernandez *et al.* 2002; Wilson *et al.* 2005; Hutson and Terry 2006; Banerjee 2008; Cook *et al.* 2010).

Loose sediment samples for XRF analysis were air dried at 40°C to remove moisture content, and then crushed to

pieces of <2mm in size using a pestle and mortar. The crushed sample was then ground in an agate mill and pressed into pellets using boric acid and a 12-tonne press. The pellets were analysed using an X-ray spectrometer for a range of major and trace elements. The p-XRF samples were poured into circular plastic containers, closed on one face by a polypropylene film. The powder is gently pushed against the polypropylene film using a mortar, in order to remove air trapped and to permit a direct contact between the samples and the film. The samples are then placed into the portable XRF stand, which is closed by a lead lid. The samples are analysed for a range of major and trace elements using a portable XRF Niton XL3T GOLDD plugged into the stand. The reported values are in parts per million.





Fig. 2.12 Taking micromorphology samples from archaeological deposits in the Nasrid palace, Cartuja, Granada

For archaeological contexts, an element enrichment index was calculated (*sensu lato*; Belzile *et al.* 2004) dividing element concentration for each sample by the average element concentration for surface geology samples from the surrounding area resulting in a mean value. Indexes of enrichment three or more times larger than the mean background value were considered potentially highly enriched (Belzile *et al.* 2004). A three-tiered system to measure enrichment has been developed to enable the impact of geochemical changes and fluctuations to be easily identifiable; concentrations 2.95 times the background mean value were considered high; concentrations between 2.50–2.95 were considered medium level; and concentrations between 1.5–2.5 were considered low level.

#### *Earth science methods and building materials*

Visual earth science and geochemical methods were used to describe building materials from Spain, following the successful application of these techniques in sourcing ancient stone, brick and mortar materials in several different study areas (e.g. Hayward and Black 2019). There are a number of scientific studies on mortar from Spain, however these have focused on the macroscopic analysis of Roman

hydraulic mortars (e.g. Guerra García *et al.* 2013) or the engineering properties of medieval tapial (rammed earth; e.g. Aguarde *et al.* 2004), prompting the need for the preliminary visual analysis of medieval mortars and tapial in this study. High-resolution thin-section comparative microscopic analysis, for example, has been successful in determining the character and source of worked stone from Roman Britain (e.g. Hayward 2009; Allen 2014). ICP-AES geochemical preparation and statistical analysis have been used to establish the source of Victorian stone and brick building materials in Glasgow (Hayward 2015), where multivariate statistical techniques (Baxter 1994, 2003) have been used to group and discriminate the geochemical data.

Samples were collected from a range of castle types in Guadalajara, Andalusia and western Catalonia (Fig. 2.13). With each castle or construction phase, five representative and well-preserved mortar samples were taken to ensure a good representative statistical and geochemical sample size. The application of a 1kg mason's hammer and sharp chisel to each building material sub-sample ensured that a small fresh fabric surface was exposed. Sub-samples were examined under a hand lens (Gowland  $\times 10$ ) and long arm stereo microscope and their macroscopic texture, colour (Munsell Color Group 1980) and inclusions recorded. Treatment of dilute hydrochloric acid determined whether or not the rock or mortar had a calcareous composition. A 20mm long  $\times$  15mm thick sample was large enough to undergo thin-section preparation and analysis, with the remaining sub-sample ground up as powder for geochemical analysis. Although destructive, this method ensured that the maximum amount of information could be obtained from the smallest possible sample size, thus fulfilling the museums and archives sampling policies.

Sub-samples underwent thin-section preparation using the rock preparation facilities at Hands on Thin Section. The procedural implications and sample preparation can be referred to in Hayward (2009). Each sample was additionally embedded in coloured araldite resin (CY1301); the process of embedding with the addition of a hardener (HY951) strengthened the mortar samples, whilst the addition of a green colouring agent (BW1034) highlighted the pore spaces in the sample enabling the overall porosity to be determined. Staining is a necessary process (Adams and Mackenzie 1998) during the production of the more lime rich thin sections. It picks out the variability in colour between ferroan and non-ferroan calcite as well as dolomite, with the addition of Alizarin Red C and Potassium Hexacyanoferrate. This high-resolution petrographic approach enabled each 30 micron-thick slice of stone, mortar and tapial to be viewed under the polarising microscope at magnifications greater than  $\times 400$  (Leica DMLP). Thin sections can help distinguish between different types of calcite grains, minerals, cements and microfossils.



Fig. 2.13. Map showing sites sampled for fabric analysis included in this study

### Palynology

The analysis of lake (Spain, France) and peat (France) sediments was intended to be an important off-site component of this study. This would have provided key information on vegetation change and land use in the case study territories. A significant number of existing sequences are from high altitude deposits, and therefore only provide indications of the exploitation of marginal environments. The main programme of coring was carried out in the province of Guadalajara. This was initially used to investigate the extent of historically irrigated soils, and then to obtain material from three lakes (coded Tordesilos, La Yunta and Campillo) within the vicinity of Molina de Aragón. Following a regional evaluation, these lakes were chosen on the basis of their proximity to key sites, including a historical

mining district in the eastern part of the geopark as well as the frontier with the lands of the Crown of Aragón, but also where there was limited modern disturbance. Sediment cores varying in size from 90–120cm were obtained (Fig. 2.5). Unfortunately, pollen was poorly preserved in all but one of the Tordesilos sequences. Pollen was extracted by Astrid Röpke (Cologne) from sub-samples with a suitable pollen count, prepared beforehand in Reading. Four of these samples from the upper part of the sequence were then sent to BETA for AMS dating, but the resulting chronology was far older than expected, with dates ranging from  $3320\text{--}8940 \pm 30$  BP. This suggests the historical part of the sequence had been truncated. The lakes of Guadalajara have been historically affected by seasonal drying which appears to have denuded their sediments.

As a result, this study has included existing palynological work in the province and in adjacent areas that may contribute to reconstructing medieval land use. In Andalusia, palynological work conducted by Gonzalo Jiménez Moreno (Granada) has informed landscape reconstructions for that case study region. In the French eastern Pyrenees, Jean-Michel Carozza (La Rochelle) obtained peat cores from Vallsera using a percussion corer (Cobra TT) from which palynological profiles were constructed for this project. Data from published pollen sequences was also included (see Chapter 13).

### Chronology and dating

A multi-proxy approach to dating was adopted for this study, consisting of a chronological framework informed by written sources and the relative/absolute dating of archaeological materials. The events associated with the creation and delineation of each frontier are described in extant written sources. These are fragmentary and unevenly represented for both Iberia and Occitania, but they are punctuated by treaties and charters which capture specific moments in the creation and maintenance of political borderlands and related claims of propriety. Separate archaeological chronologies were constructed for each site, territory and region through a combination of historical and archaeological dating, the latter including select absolute dating methods (see below) and relative dating based on ceramic typologies and standing architectural remains. The emphasis throughout was on the *longue durée* perspective, which enabled the creation and dissolution of frontiers to be contextualised.

#### Absolute dating methods

##### Radiocarbon dating

The principles and methods of radiocarbon dating are well represented in numerous publications (e.g. Libby 1955; Lowe and Walker 1997). Samples of animal bone and plant materials from archaeological contexts were sent to Beta Analytic for AMS dating to refine site chronologies. Dating of wood and charcoal was minimised to avoid inaccurate chronologies arising through samples derived from old wood, potentially already centuries old at the time of deposition. Four AMS dates provided by Beta Analytic from Tordesilos in Guadalajara demonstrated the upper part of the sequence was prehistoric. Dating of peat samples obtained from the vicinity of Vallsera enabled the medieval period to be identified within the cores. Twenty-six samples of human and animal bone were also dated by Vilnius Radiocarbon to provide a more robust chronology for isotopic studies (see Chapter 8). Radiocarbon dates were calibrated using the IntCal13 calibration dataset (Reimer *et al.* 2013), with age-depth models constructed for pollen sequences using a Bayesian statistical approach within the Bacon computer

program (Blaauw and Christen 2011). The age-depth models produced comparable results that compare favourably with existing palynological studies from other parts of Iberia and Pyrenean France.

##### Coins

Coins were found at the majority of sites associated with the project and provided dates associated with their production. Coin chronologies are well established for al-Andalus, Christian Iberia and Occitania before and after the French annexation.

### Scales of integration

Integration was achieved through the consistent use of two factors that were common to every set of data: a specific geographic (Cartesian) location and a temporal context (i.e. an associated time period). A key objective of this study was to develop a robust chronological framework for the case study areas, and one of the most challenging aspects has been reconciling the chronology provided by written sources with dating based on archaeological materials. The integration of data takes place on multiple levels and is a common feature of archaeological site reports, as well as more wide-ranging studies. Individual datasets were integrated through the process of specialist analysis, and these synthesised datasets were then integrated at varying temporal and spatial scales. This multi-scalar approach ultimately enabled broader, inter-regional trends to be observed and compared with the nuances of interactions between the different populations of medieval Iberia and Occitania. The result is an inter-regional model which can be tested and challenged with future excavations of individual sites alongside palaeoenvironmental studies. Above all, it emphasises connections between multi-scalar levels of analysis, specifically sites and their associated territories. The study's research questions were also informed by a theoretical framework which provided a cohesive approach to all the case study regions.

### Theoretical framework

The study of medieval frontier societies in Iberia and Occitania benefits from the use of three theoretical frameworks: frontier theory, post-colonialism and cultural resilience.

#### Frontier theory

As outlined in Chapter 1, the multi-lingual and multi-disciplinary historiography of medieval Iberia is characterised by the study of frontiers as spaces at 'the edge' and as composite societies. The exceptionalism of Iberian society promoted in earlier historiography was eventually challenged at the European scale. In his seminal work on the expansion of Europe, Robert



Bartlett (1993) included Iberia as one of many regional case studies of Europeanisation, which was characterised by frontier societies and cultural encounters between opposing societies. In Iberia, the movement of the frontier pushed the edge of Latin Europe further southwards, and Castilian, Aragonese and Portuguese secular and religious institutions were in part replicated, in part created, with each incremental territorial conquest; a process widely referred to in Iberian and French scholarship as feudalisation. In recent scholarship, the Catholic nationalist notion of this process as the *Reconquista* has been replaced with an understanding of the ad hoc formation of Iberian frontiers, serving varied territorial ambitions. In the medieval eastern Baltic, the encounter with the environment was closely related to the ideology of colonisation promoted by the new Catholic regimes, as protocols of resource exploitation were developed to sustain conquest and settlement (Pluskowski 2019). In Iberia, the encounter with the environment – natural and anthropogenic – is equally important for understanding both the development of Andalusian society and the expansion of Christian polities (Glick 1995).

This study makes use of Berend's (1999) distinction between a 'frontier zone', a borderland between polities defined by centres in the landscape, and a 'frontier society', defined as a political unit that incorporates heterogeneous groups following territorial annexation and migration. Exploring the relationship between the two is a key feature of this study, and we must question to what extent does a 'frontier society' persist after the geographic relocation of the frontier and the transformation of this formerly borderland political unit into what can be envisaged as a heartland or core territory of the expanding state? At what point does a 'frontier society' become just a 'heterogeneous society'? Surely the proximity of the frontier zone plays a role – a space which limits and disrupts the control exerted by the states on both sides – as does the ability of state authorities to impose a functional degree of institutional homogeneity in the decades and centuries following the dissolution of a frontier. In this respect, it does not seem appropriate to generalise about Iberia as a frontier society between the 11th and 16th centuries, even though this term has been widely used in the scholarship. However, the long-term perspective adopted for each case study region aims to capture the impact of different frontiers – both external and internal – with varying mobility on their associated populations and cultural landscapes. Elements of this impact are immediate, others are more protracted, and here Enrique Rodríguez-Picavea's (2005) four phases defining the creation of medieval Iberian frontiers (military, socio-economic, cultural and political-administrative) are useful for framing their development. Contemporary essentialist framings of the frontier can also be compared with the lived experience of different communities within the frontier zone, with

*convivencia* expressed in varying ways. These are most effectively tackled with post-colonial theory.

### Post-colonialism

Within the last two decades, there has been growing scholarly interest in a post-colonial Middle Ages. Post-colonial theory is particularly relevant for understanding social processes in frontier societies, which are commonly characterised as heterogeneous and hybrid (Naum 2010, 2012, 2013). In a seminal paper, Nadia Altschul (2009) argued that medieval Iberia represented the ideal area for the application of post-colonial approaches, where multiple forms of colonial contact from the Roman period through to the Almoravid, Almohad and later Christian conquests could be scrutinised. This would add further nuance to our understanding of frontier society heterogeneity and redress the imbalance resulting from Euro-centric bias. She highlighted the need for re-examining the notion of *convivencia* through this theoretical lens, for replacing 'acculturation' with 'transculturation', which emphasises mutual rather than one-sided change as a result of contact, and the related notion of mimicry. The latter two are widely used (and critiqued) in Latin American scholarship. Altschul also drew attention to the widespread dismissal of the value of exploring the racial dimensions of medieval Iberian societies, and to the ethical resolution of the inequalities resulting from colonial encounters. Michael Gerli (2007), Maya Soifer (2009) and Michelle Hamilton (2009) have also argued for post-colonial approaches to be expanded within Sephardic studies.

Altschul's call for greater engagement with post-colonialism, now over a decade ago, has been met with limited enthusiasm, mostly from a handful of Anglophone scholars working with Iberian art and literature (e.g. Weiss 2012; Eggleton 2017). But it has had little impact within the Spanish and Portuguese medievalist community. Some facets of post-colonial theory, such as 'creolisation', have not been adopted at all, even though they are potentially applicable to furthering our understanding of the power inequalities between Jews, Muslims and Latin Christians (Gowers 2022, 276). Nonetheless, Iberian historiography has engaged with the themes that are relevant to post-colonial thought relating to power relations, migration (especially the notion of *repoblación* and its implications), variable cultural encounters, appropriations and transformations (Carvajal López 2019). Its contribution is to break up the dichotomies created by medieval commentators and later nationalist historiography, and to complicate our understanding of the nuances of cultural exchanges and the diversity of lived experiences. Archaeology, with its multi-scalar and long-term approach to a range of material traces, is well placed to engage with the themes of post-colonialism (Eger 2019; García-Contreras 2021). The diachronic approach to the cultural landscape, treating space as a palimpsest, provides a valuable means of contextualising the impact

of ethno-religious encounters following conquest, regime change and migration. The relationship between migration, material culture and the cultural landscape is ultimately at the heart of this study.

A crucial facet of medieval *convivencia* is the notion of agency, which defines the dynamics of power relations. The term agency is increasingly used by archaeologists interpreting peasant communities in medieval Iberia, even if ‘agency theory’ itself is not employed as a conceptual framework. Drawing on micro-historical approaches, Juan Antonio Quirós Castillo (2020) introduced the concept of ‘small worlds’ to analyse the emergence of social inequality within rural communities in early medieval northern Iberia. This emphasised the agency of peasant communities in generating social hierarchies, rather than the top-down actions of the governing elites. Central to this is the relationship between political (feudal) and moral (peasant) economies (Wickham 2005, 535–547); the former generating structural inequalities, the latter collective practices which mediate and balance social relations at the local level. This framework is potentially applicable to the study of later medieval frontier societies, where the coexistence or *convivencia* of different ethno-religious communities is defined by inequalities. Focused case studies with suitable amounts of data enable the analysis of complex local realities. In the case of Iberia, peasant agency is evident in the cultural landscape from Andalusi and later Christian (and Jewish) migrants. In the case of Occitania, there is an elite migration associated with regime change, but native peasant agency and resistance has been examined through the micro-historical approach employed by Le Roy Ladurie (1975) and Weis (2000). However, the term agency has also been used in the context of understanding Muslim and Jewish communities living under Christian rule more generally. This is connected with the notion of cultural resilience.

### Resilience

The concept of resilience was originally adopted from ecology. A recent survey of its usage within archaeology highlighted an emphasis on responses to environmental stresses, particularly climate change, resource deficiency and water management. This, in turn, was connected to varying notions of sustainability (Jacobson 2022). Conquests, a recurring mechanism in the creation of medieval frontiers, take advantage of existing societal stresses and generate new ones, which may have visible environmental dimensions. For example, climatic fluctuations have been interpreted as playing an important role in state decline and fragmentation, paving the way for conquest (e.g. Fleitmann *et al.* 2022). However, the notion of *convivencia* highlights a more nuanced form of resilience which has been widely discussed by anthropologists and human geographers, and particularly within urban studies (Adger 2000). The concept has also been adopted more broadly within medieval studies

in recent years (e.g. Endress *et al.* 2020). This is both social and ecological (or socio-ecological) resilience, and it includes the adaptation of cultural forms – language, clothing, social customs, art, architecture, music, technology – as much as subsistence strategies, resource exploitation and the organisation of land use. Indeed, the two are intimately connected, especially when considering the relationship between food production and culinary culture, the latter playing a key role in the construction and maintenance of ethno-religious identities. The significance of these identities has already been highlighted in Chapter 1, with language and religion as defining features. In this respect, the responses of indigenous or resident populations to regime change, migration and the imposition of new societal norms can be framed within the context of ‘resilience’.

### Notes

- 1 <http://centrodedescargas.cnig.es/>
- 2 <https://geoservices.ign.fr/lidarhd>

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## **PART 2: IBERIA**



## Sites in Iberia: The historical and archaeological data

*Guillermo García-Contreras, Luca Mattei and Aleksander Pluskowski*

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### Introduction

This chapter introduces the historical background and contextual data for the archaeological and environmental sites in the principal case study areas in Spain, and provides an outline of their chronology. The province of Guadalajara (Castilla-La Mancha) (Fig. 3.1) and the provinces of Granada, Jaén and Málaga (Andalusia) (Fig. 3.2) are outlined here as the main case study regions, whilst data from additional sites in Cáceres province (Albalat) are discussed in Chapter 6, Murcia (San Esteban and Lorca) in Chapter 7 and the province of Lleida (Catalonia) in Chapter 10.

### Guadalajara

#### Geography

The province of Guadalajara encompasses strikingly diverse landscapes, defined by underlying plutonic, metamorphic and sedimentary geology. This includes areas with complex Hercynian and Alpine structures as well as non-folded Cenozoic regions. There is a variable erosional history across the province resulting in parts covered with thick superficial deposits alternating with areas lacking those deposits, where broad outcrops of underlying rock define the landscape (García-Quintana *et al.* 2005; Calonge and Rodríguez 2008). The northern part of the province is dominated by the Sierra de Guadarrama and Sierra de Ayllón mountain ranges (with heights ranging from 600–2500m.a.s.l.), marking the watersheds of the Ebro to the north-east and the Duero to the north-west. The south is characterised by expansive agricultural plains and plateaus, again with areas of variable topography. The region is crossed by two major rivers – the Henares, a tributary of the Jarama, and the Upper Tajo (Tagus). The latter runs east–west along the southern part of the province where it has carved out deep canyons and gorges in the karstic landscape. Here it has formed

the densest network of riverine canyons in Iberia. This is now protected within the bounds of the Molina-Alto Tajo UNESCO global geopark, designated in 2015, half of which lies within the Alto Tajo Natural Park which was founded in 2000. The boundaries of the geopark also roughly correspond to those of the medieval lordship of Molina de Aragón (Fig. 3.3).

#### Historical background

The origins of the territorial subdivisions within the modern province of Guadalajara date back to the medieval period, a region which formed the frontier between Muslim and Christian polities for several centuries (Fig. 3.4). Between the 8th and 11th century, the region was part of al-Andalus, known as *at-Tağr al-Awsaṭ*, or in Latin sources as *Marca Media* or the ‘central march’ (Manzano Moreno 1991). Here, the territory was organised into districts called *coras*, with a dense network of rural communities engaged in the intensive exploitation of various natural resources, including irrigated fields and salt works (García-Contreras Ruiz 2016a). In the 11th and 12th centuries, Castilian (and in the easternmost part, Aragonese armies) incrementally conquered and annexed much of this region, and a new frontier territory called *Extremadura Castellana* was created. This bordered neighbouring taifa states and subsequently the northernmost frontier of the Almoravid and Almohad empires. Various lordships and manors were established within the province and numerous rural settlements became populated by Christian migrants. At the same time, the Christian regime invested in a new programme of construction of castles, town walls, churches and monasteries.

The conquered territory was eventually sub-divided into domains called *comunidades de villa y tierra* (‘town and land communities’). These were controlled by town councils, with the term referring to both towns and their associated territories (or patrimonies) in both economic and political terms (Martínez Díez 1983; Estepa Díez 2006).





Fig. 3.1. Map showing the province of Guadalajara with sites mentioned in the text

This saw the establishment of a series of frontier lordships which were endowed with a principal city and a dependent territory with rural settlements. These ‘town and land’ communities, which were a typical form of lordship in the borderlands of the kingdom of Castile, would eventually constitute the territorial bases for the divisions of the modern Spanish state. The easternmost part of the province was initially conquered by Aragonese armies in the 11th century, and shortly after became a largely autonomous lordship under the control of the Lara family, internally subdivided into districts called *sexma*. Molina came to represent a buffer territory between the borderlands of the two major Catholic polities in Iberia: *Extremadura Castellana* and the *Extremadura Aragonesa*. From the 16th century, the largest and most politically important cities within Castile were designated as capitals of several agglomerated territories. One of these became the province of Guadalajara, the boundaries of which have remained essentially the same since c. 1590. The province’s current form dates to the administrative reforms of the 19th century (Martínez Díez 1981; Ballesteros *et al.* 2001).

### Archaeological sites

Sites dating to the medieval period in the province of Guadalajara consist of urban centres, rural settlements, fortifications and monasteries. The best known archaeologically are urban areas and fortifications, whilst rural settlements have been largely mapped through fieldwalking, surveying earthworks and documenting ceramic scatters (e.g. García-Contreras 2020a). There are some 200 known fortifications in the province (Jiménez Esteban 1992; Rubial Rodríguez 1992; Layna Serrano 1994; AA.VV. 2003; Daza Pardo 2007), of which the excavations of only twelve have been published. These are: Alcázar de Guadalajara (Cuadrado Prieto and Crespo Cano 2018), Guijosa (Rivera Gámez and Vela Cossio 2005), Castilnuevo (Abril Urmente 2012), Embid (Martínez *et al.* n.d.), Brihuega (Abril Urmente *et al.* 2012b), Jadraque (Retuerce Velasco and Prieto Vázquez 2018), Torija (Condado Ayuso 2011), Cifuentes (Cuadrado Prieto 2017), Hita (Abril Urmente *et al.* 2012a), Zorita de los Canes (Urbina *et al.* 2015; Urbina and Urquijo Álvarez de Toledo 2022), Palazuelos (Vela Cossio and Villafruela Arranz 2002; Gámez and



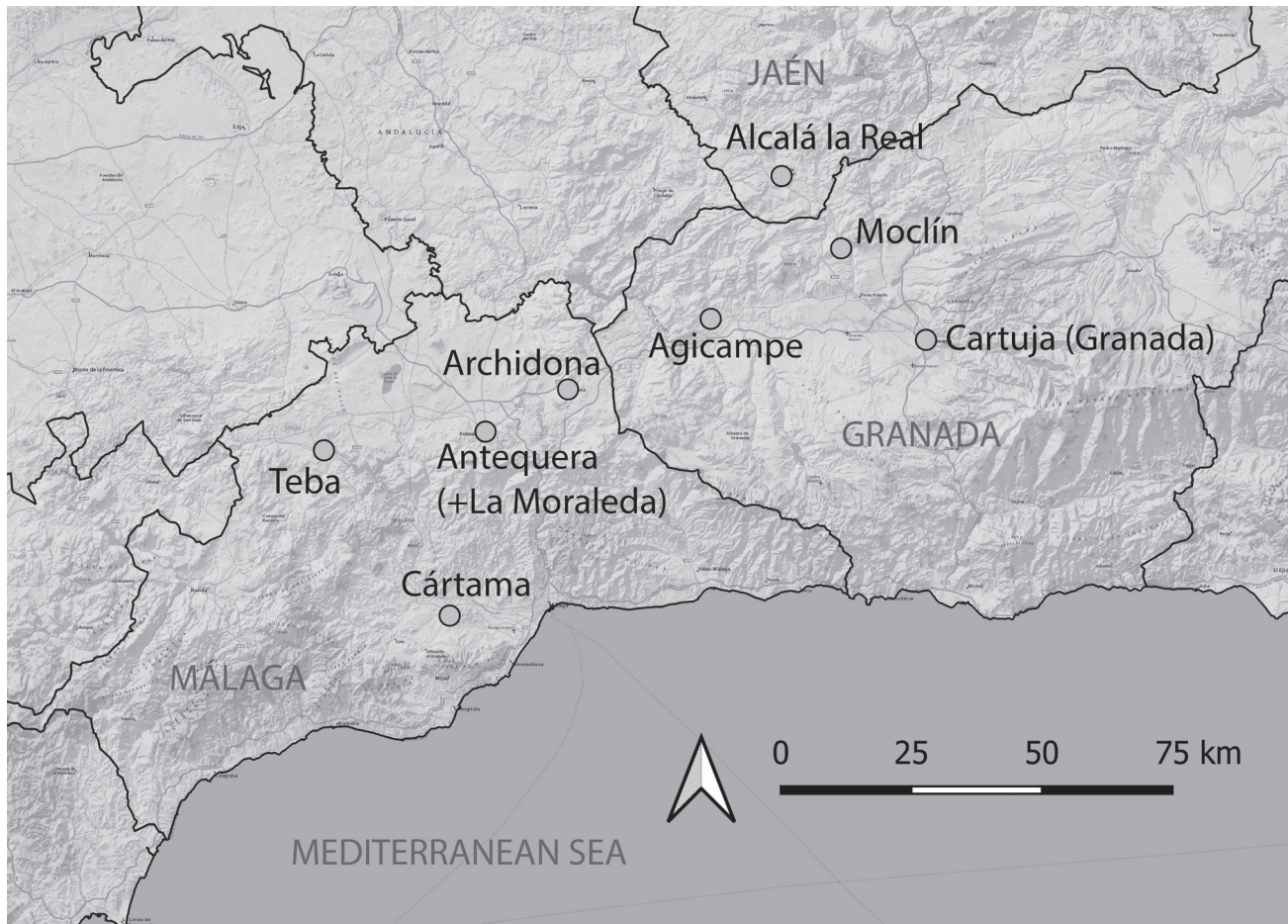


Fig. 3.2. Map showing the provinces of Granada, Málaga and Jaén in Andalusia with sites mentioned in the text

Torres 2005), Cogolludo (Daza Pardo 2017) and Molina de Aragón (Arenas Esteban 2008).

Two of the most important castles in the region were chosen as the territorial foci for this study: Molina de Aragón and Atienza. They functioned as centres of frontier authority in both the Islamic and Christian periods, and after the Castilian/Aragonese conquests, they provide contrasting types of lordship; Molina became a private and largely autonomous seigniorship and Atienza became a royal district and eventually a *comunidad de villa y tierra*.

### **Primary sites: Guadalajara**

#### *Molina de Aragón*

Molina de Aragón is the capital of the region historically known as the Señorío de Molina, located in the eastern part of the province of Guadalajara at 1065m.a.s.l. The fortified complex of Molina de Aragón is located on a hill consisting of Upper Triassic/Lower Jurassic dolomite and overlooking the valley of the river Gallo, a tributary of the

Upper Tajo. It consists of an *alcazaba* or citadel connected to an *albacar* or enclosed ward containing some form of settlement, and a separate tower with a walled enclosure or barbican on top of the hill, the so-called Torre de Aragón. There is no data from the site itself before the 10th century. Some researchers have argued that the earlier settlement may have been located a few kilometres further north, in a place called Molina la Vieja (Old Molina), based on ceramic fragments identified on the surface through fieldwalking (Checa Herraiz 2014, 2018).

There is more evidence for the use of the site from the 11th century when Andalusí governors are mentioned in relation to the Taifa of Molina, suggesting the site of Molina may have functioned as the polity's centre (Pérez Fuertes 1990). Following the Christian conquest of the region by Alfonso I of Aragón in 1129, Molina would be incorporated into the crown of Castile but functioned as an autonomous lordship under the control of the Lara family (Estepa Díez 2006; Fabián Fabián 2012; García-Contreras 2018; Ortega Ortega and Arenas Esteban 2018). As the

# MAPA DEL GEOPARQUE DE LA COMARCA DE MOLINA Y EL ALTO TAJO (GUADALAJARA)

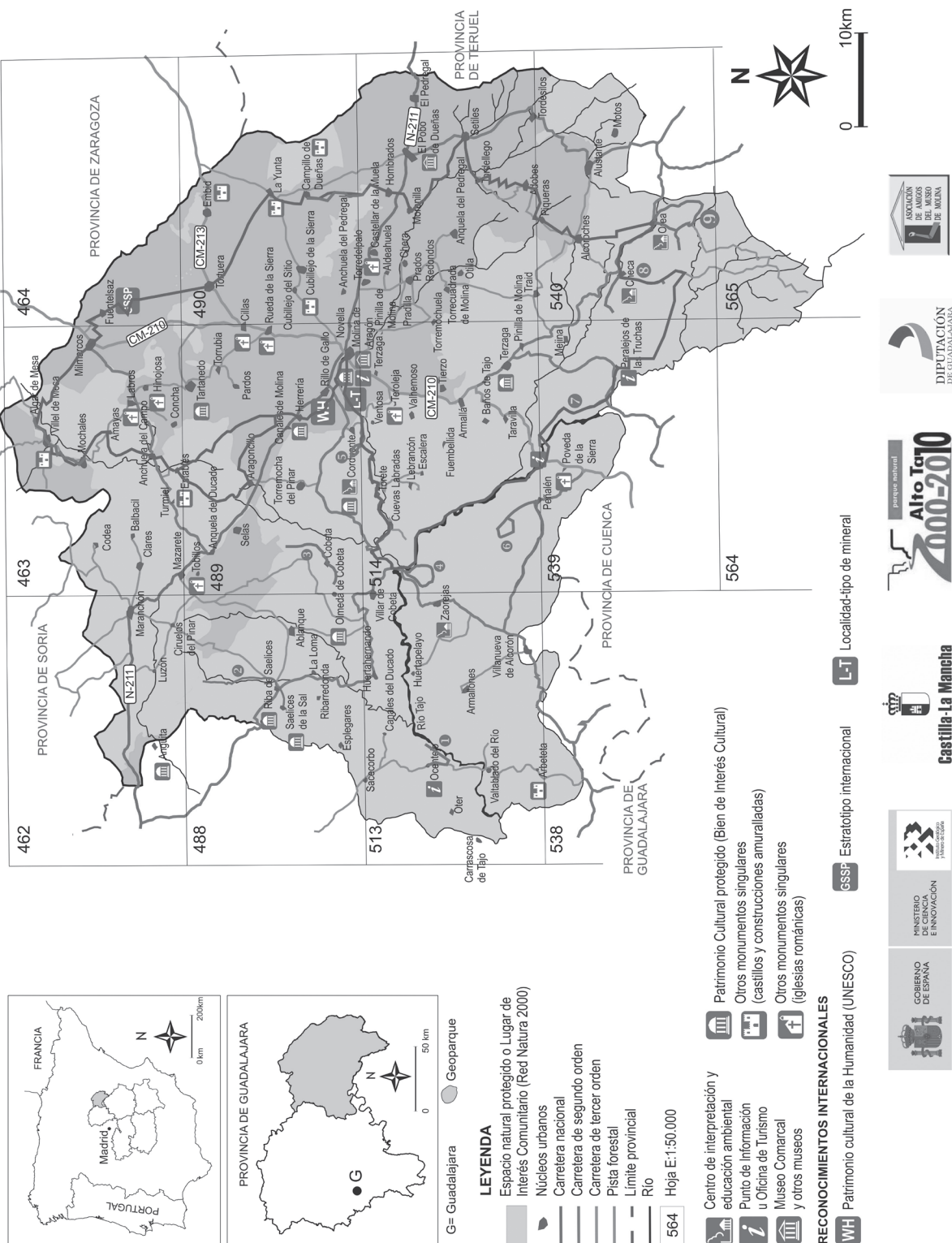


Fig. 3.3. The map of the Molina-Alto Tajo UNESCO Global Geopark (© Geoparque Molina Alto Tajo)



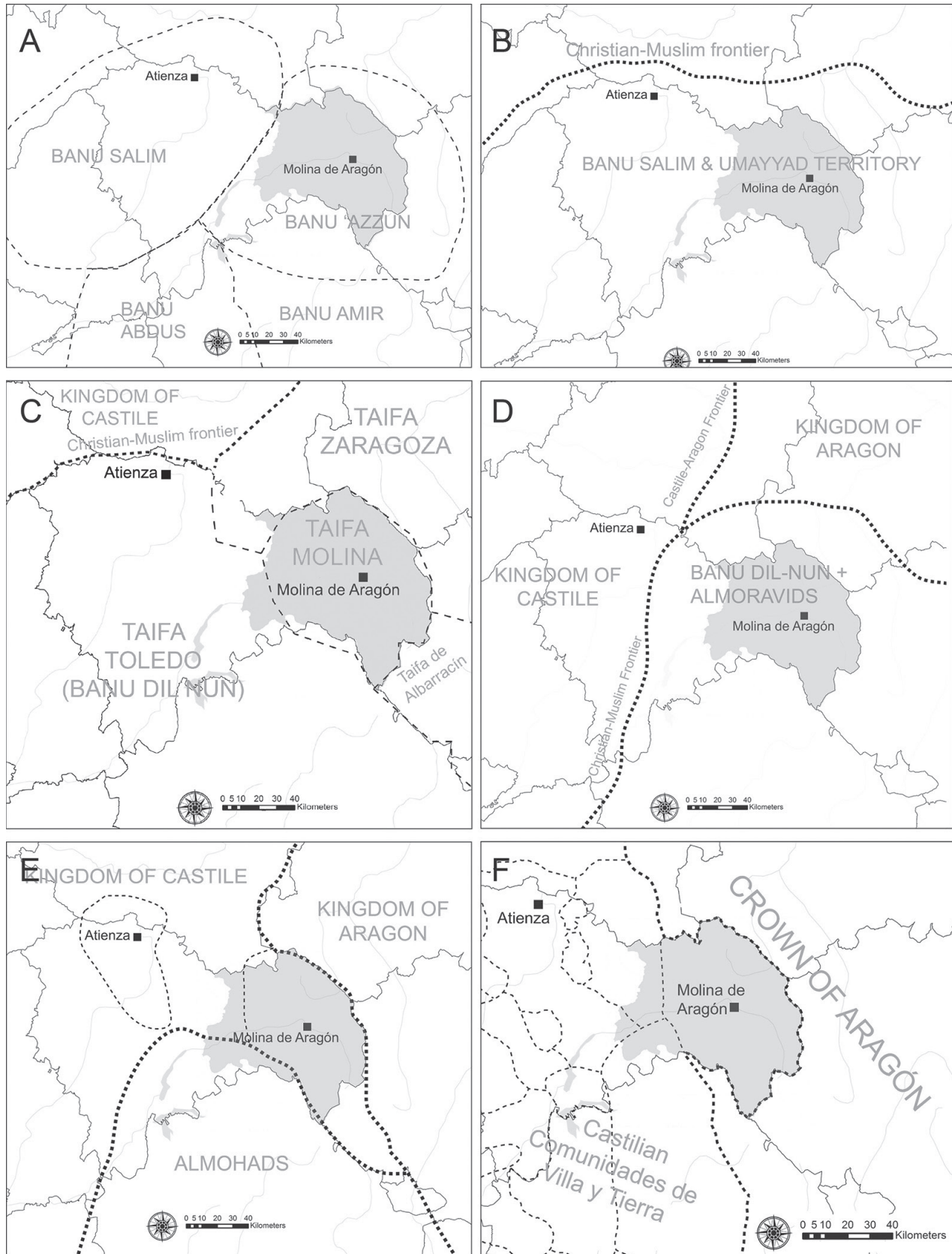


Fig. 3.4. Maps showing the evolution of the frontier in the territories of Molina de Aragón and Atienza

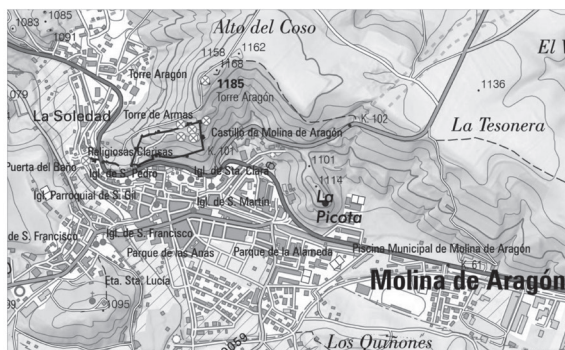
frontier with Andalusi territory moved southwards, the lordship of Molina became a west–east borderland between Castile and Aragón. This situation did not change until the middle of the 14th century, and in 1369 it came under the governance of the crown of Aragón for six years (hence its name, Molina de Aragón) (Benítez Martín 1992), after which it came under lasting Castilian control. Its castle was the seat of the governors of Molina, and although it was gradually abandoned from the 16th century, it still retained some importance, especially during the wars that took place in subsequent centuries.

#### ARCHAEOLOGY

The castle has seen several archaeological investigations, prior to those conducted within the framework of this project. The first excavations were carried out in 1995 within the ruins of the church of Santa María del Collao (aka ‘Cristo de las Murallas’). Located within the *albacar* by the Puerta del Reloj entrance, its remains had been uncovered before the excavations took place (Arenas Esteban 2008, 32). The plan and architectural style of the church suggested that it was built in the 12th century, but it is first mentioned in written sources in the 13th century. It was destroyed by Napoleonic troops during the War of Independence (Abánades 1963, 44). Between the 12th and 19th centuries,

various phases of occupation and re-occupation were identified, with a clear phase of rebuilding in the late medieval/early modern period which was also documented in written sources (Arenas Esteban 2008, 32). Between 1998 and 2005, extensive excavations took place at the ‘Prao de los Judíos’ (aka ‘Castil de los Judíos’), a district adjacent to the castle associated with a Jewish settlement after the Christian conquest. They uncovered numerous domestic structures, as well as the remains of a synagogue and *mikveh* (ritual bath). In 2004 there was an excavation within the courtyard of the *alcazaba* (2004) and in 2005 trenches were opened within the Torre de Aragón. All the excavations between 1995 and 2005 were directed by Jesús Arenas Esteban (Arenas Esteban 2002, 2008, 2017; Arenas Esteban and Martínez Naranjo 2004; Arenas Esteban *et al.* 2007; Arenas Esteban and Castaño González 2010) (Fig. 3.5). They demonstrated a lengthy period of occupation spanning the 2nd millennium AD which could be sub-divided into five phases:

1. The Andalusi period. Occupation could be dated from the 10th/11th century through to the first decades of the 12th century. The oldest part of the complex was the Torre de Aragón, which consisted of a trapezoidal enclosure with a central tower, both of which were subsequently concealed by masonry from the Christian era. The original structures were built of rammed earth (*tapial*), and some



- 1 First walled enclosure (Alcazaba)
- 2 Second walled enclosure (Albacar)
- 3 Tower of Aragón
- 4 Church of Santa Catalina
- 5 Jewish quarter (Prao de los Judíos)
- 6 Third walled enclosure
- 7 Torre de los Veladores
- Previous excavations



Fig. 3.5. Localisation of Molina de Aragón showing key features and areas of previous excavations



of these walls retained a coat of white plaster on their outer face. In the *alcazaba* and *albacar* this is the most poorly preserved phase, partly the result of demolition during later periods of construction. At the foot of the so-called 'Torre de los Veladores' a section of wall built on an earthen rampart with its external face covered with lime was also uncovered. The earliest ceramic finds at the site came from a silo in the south-eastern corner of the Prao de los Judíos, dated between the 10th and 11th centuries.

2. The Christian medieval period. This begins with the conquest of Molina in 1129 which was followed by the gradual transformation of the *alcazaba*. The three towers on the southern side were completed towards the middle of the 13th century, and further modifications in the 14th century gave them their present appearance. Much of the courtyard remained open with a rammed clay pavement located some 1.2 m below the present-day topsoil. A series of buildings were constructed also up against the walls, but their function remains unclear. At the Torre de

Aragón, the earlier *tapial* walls were rebuilt in stone, a cistern was constructed, and a large pentagonal tower was raised. The external appearance of the latter has essentially remained unchanged into the present day (Fig. 3.6).

3. The 17th-century phase. This was associated with the quartering of Philip IV's soldiers at the castle in 1640, during his campaign against the Catalan Revolt. Some parts of the wall, especially that on the southern side of the castle, have been attributed to this phase. The medieval entrance of the Torre de Aragón was reconstructed, as well as other structures within the enclosed space. The rebuilding of the southern end of the tower transformed access to the barbican, with the addition of a rectangular lobby and a sentry box.
4. The 19th-century phase. This was related to the War of Independence (1807–1814) and the quartering of Napoleonic troops at the castle, as well as Elizabethan troops during the later Carlist Wars. A large room was built in the Torre de Aragón between 1810 and 1811. In addition, scattered throughout various points inside the



Fig. 3.6. Torre de Aragón



barbican were the remains of other buildings intended for the accommodation of soldiers, as well as stables and stores, and a series of trenches on the southern, western and eastern sides of the barbican.

5. The period of restoration. During the 1960s restoration works led by the Fine Arts Directorate dismantled structures from the second phase and utilised grey cement mortar for rebuilding parts of the castle. This has been described as ‘the most aggressive action that the monument has suffered throughout its history’ (Arenas Esteban 2008, 26).

Further small-scale excavations in the *albacar* took place in 2015, 2016 and 2017 within the framework of this study’s pilot projects. Their aim was to clarify the stratigraphy in different parts of the fortified complex and to evaluate the preservation of ecofacts (García-Contreras Ruiz *et al.* 2016; Banerjee *et al.* 2020). Following geophysical surveys of both the *albacar* and *alcazaba* in 2016 (García-Contreras *et al.* 2023), a trench was opened in the upper part of the *alcazaba* in 2020 and 2021 (Figs 3.7, 3.8). This identified the remains of a poorly built structure, perhaps used for storage, which had been subsequently used to dump rubbish in the late medieval period (Fig. 3.9a–d). Five radiocarbon dates of charcoal and bone provided a chronological range from the mid-12th to the start of the 14th century. This timeframe was reinforced by finds of coins of Alfonso I (1104–1134) and Alfonso X (1252–1284). The rubbish deposit appears to have been formed in a short period of time, in the late 12th–early 13th century, and included pieces of metalwork, animal bones and ceramic fragments. The ceramic assemblage was dominated by kitchenware, with some examples of tableware, suggesting this represented the clearing out of kitchen waste. Zooarchaeological analysis, in turn, connected this with military provisioning (see Chapter 8).

Two trenches were also opened across the terraces on the adjacent hillside on the eastern side of the castle (Fig. 3.10a–c). Their aim was to determine the chronology and function of the terraces, in relation to the development of the castle and town.

#### THE URBAN AREA OF MOLINA DE ARAGÓN

The town of Molina de Aragón was established after the Christian conquest, but it has seen virtually no archaeological investigations. Architectural surveys have focused on its medieval walls and churches. In 2016, a trench was opened within an allotment on the right bank of the Gallo river, just south-east of the bridge crossed by the Paseo de los Adarves. This site was chosen due to the preservation of a historical irrigation channel that runs through an adjacent plot (Fig. 3.11a–b). A programme of coring was also carried out in parts of the southern and northern floodplain of the Gallo, within 2km of the modern built-up area of Molina. The

aim of these investigations was to uncover and date traces of the medieval irrigation system associated with the town.

#### Atienza

There is comparatively less information about the castle in Atienza than in Molina, due to the almost complete absence of archaeological investigations at the site. The castle and town are in the northern part of the province of Guadalajara, in the Sierra Norte, at an altitude of 1170m.a.s.l. The castle complex was built on the side of an outcrop of Ordovician/Silurian limestone, rising from a Triassic clay depression in the valley. The associated town was built on the side of this outcrop, resulting in a network of sloping streets. The uppermost part of the castle, the *alcazaba*, is located on top of a limestone promontory approximately 130m long, 30m wide and 12m high. This has been shaped to make access more difficult, and its walls, two water cisterns and the donjon at the southern end have been preserved (Fig. 3.12a–b). In the north-western part, the layout of the wall and the terrace indicate the existence of an *albacar*. Below this to the south-west stands the church of Santa María del Rey, which has a bilingual inscription in Latin and Arabic on its portal dating from the time of King Alfonso VIII (Thomas *et al.* 2017, 311). On the adjacent eastern slope there is a large empty space which is also enclosed by stone walls, with earthworks indicative of buried structural remains. The extent of the current urban area begins at the foothills of the eastern and south-eastern slopes (for a detailed description see Pavón Maldonado 1984, 62–67; Layna Serrano 1994, 57–82; Daza Pardo 2007; Muñoz Jiménez 2008) (Plate 3.1; Fig. 3.13).

Populated since the Neolithic, the site became more important at the time when the Christian-Muslim frontier was situated along the Duero river. The site functioned as a mustering base for Umayyad assaults against the Christian kingdoms to the north. Its importance is emphasised by its description as a city or *madīna*, rather than just a *hisa* or castle (García-Contreras 2016b). From the end of the Caliphate period until 1085 when it was finally conquered by Alfonso VI, the *madīna* variously alternated between Muslim and Christian control. In 1140, Alfonso VII granted privileges to Atienza, endowing it with a vast territory as part of its status as a *comunidad de villa y tierra*. This stretched to the Tajo under the dominion of the Castilian monarchs (García-Contreras 2018). Atienza’s lands facilitated the growth of the town, especially during the late medieval period, when it had some ten thousand documented inhabitants served by fifteen parish churches, including Nuestra Señora del Val, Santa María del Rey, San Gil and the Santísima Trinidad (Layna Serrano 2004). The castle’s importance began to fade in the 15th century, largely after the destruction it suffered in the so-called Infantes de Aragón war. In 1446 it was occupied by the Navarrese army and besieged by the Castilian king Juan II and Don Álvaro de Luna who, unable

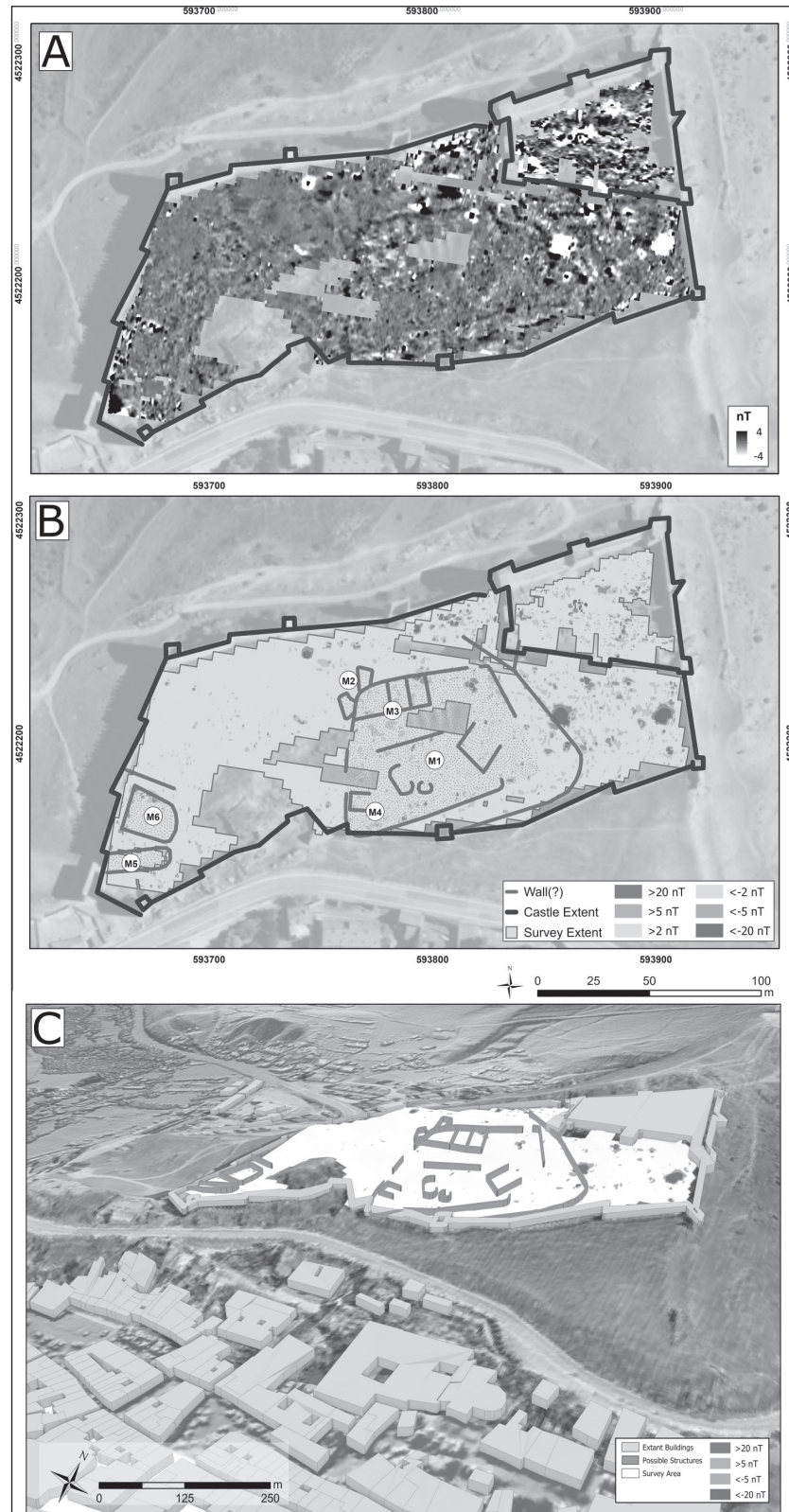


Fig. 3.7. Magnetometry survey and interpretation of anomalies within the grounds of the castle of Molina de Aragón (Rob Fry/National Geographic Information Center of Spain CC-BY 4.0, OpenStreetMap, EDINA Global Digimap Service)

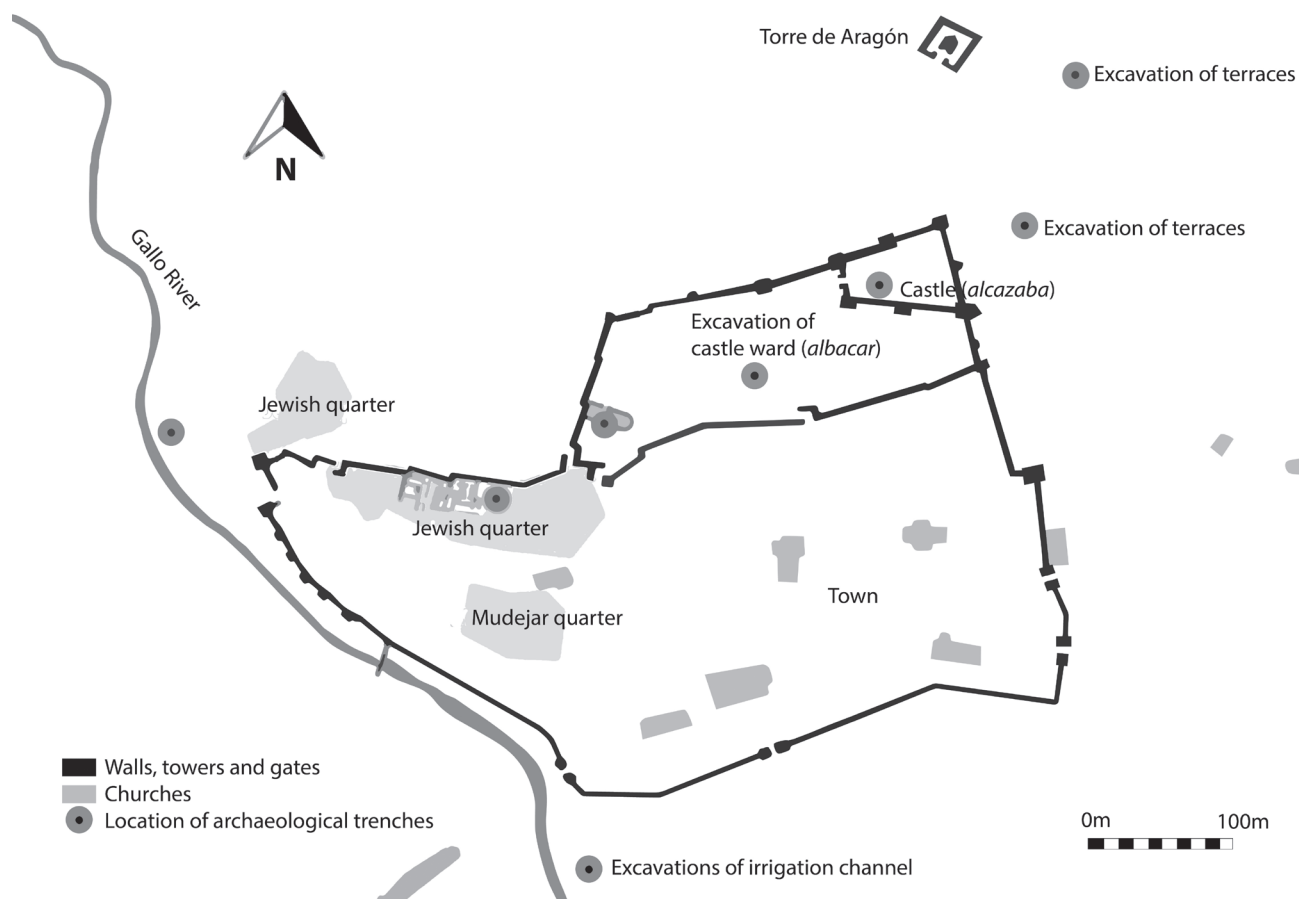


Fig. 3.8. Reconstructed plan of the castle and town of Molina de Aragón in the 14th century, showing location of previous excavations and those associated with this study

to capture the castle, abandoned the siege and set fire to the town. As a result, the district of Santa María del Rey was destroyed. Most of its Romanesque churches suffered significant damage and were rebuilt in the 15th and 16th centuries (Layna Serrano 2004).

#### ARCHAEOLOGY

The only archaeological work in Atienza has consisted of the restoration of the outer walls of the town (Muñoz Jiménez 2008) and two small trenches opened in the so-called 'Jewish quarter' which were revisited for the purposes of this study. There have been surface surveys across the urban area which resulted in the collection of large numbers of ceramic fragments (Valiente Malla and Cuadrado Prieto 1988, 635–638), with dates spanning from the 7th to 15th centuries (Retuerce Velasco 1998; García-Contreras Ruiz 2020a).

Most of the castle's construction can be dated to the 12th century and consists of regular masonry courses with ashlar reinforcing the corners and openings. In the north-west corner, the remains of a tower with masonry arranged

in a 'herringbone' pattern is similar to others in the region identified as Andalusi constructions (Daza Pardo 2007). This appears to be the oldest phase of the castle and the only clear architectural evidence from the Andalusi period, although one of the cisterns may also date from this period (Valiente Malla and Cuadrado Prieto 1988, 633–635). Within the bounds of the fortified complex, in the absence of any published stratigraphic archaeological excavations, which were not carried out even during the restoration of part of the castle wall (Muñoz Jiménez 2008), only the results of fieldwalking surveys are available.

Layna Serrano and Basilio Pavón suggested that the current church of Santa María del Rey may have been converted from a mosque (Pavón Maldonado 1984, 64; Layna Serrano 2004, 50–51). This church is located on the western slope, which today is empty and not built on. It is precisely in the western part of the wall that the only Andalusi architectural vestige has been recognised, and to the north-west is Cerro Padrastró, where the largest quantity of ceramics has been documented through fieldwalking surveys. In this respect, the Andalusi settlement must have been located between





Fig. 3.9. Excavations in the albacar of the castle of Molina de Aragón



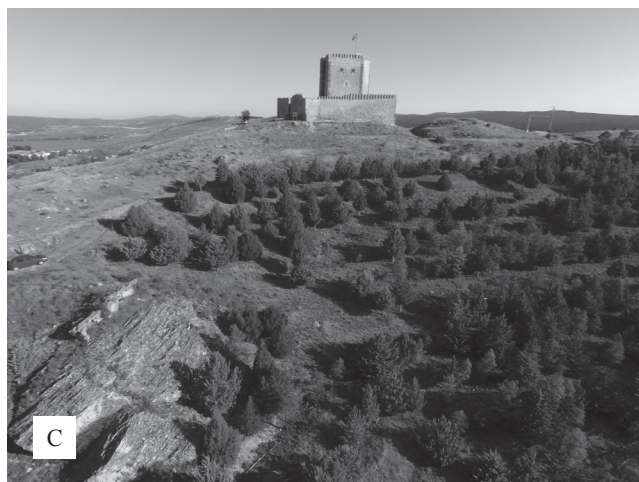


Fig. 3.10. Excavations of the terraces east of the castle of Molina de Aragón



Fig. 3.11. Excavating the irrigation channel by the Paseo de los Adarves, Molina de Aragón





*Fig. 3.12. Atienza castle*



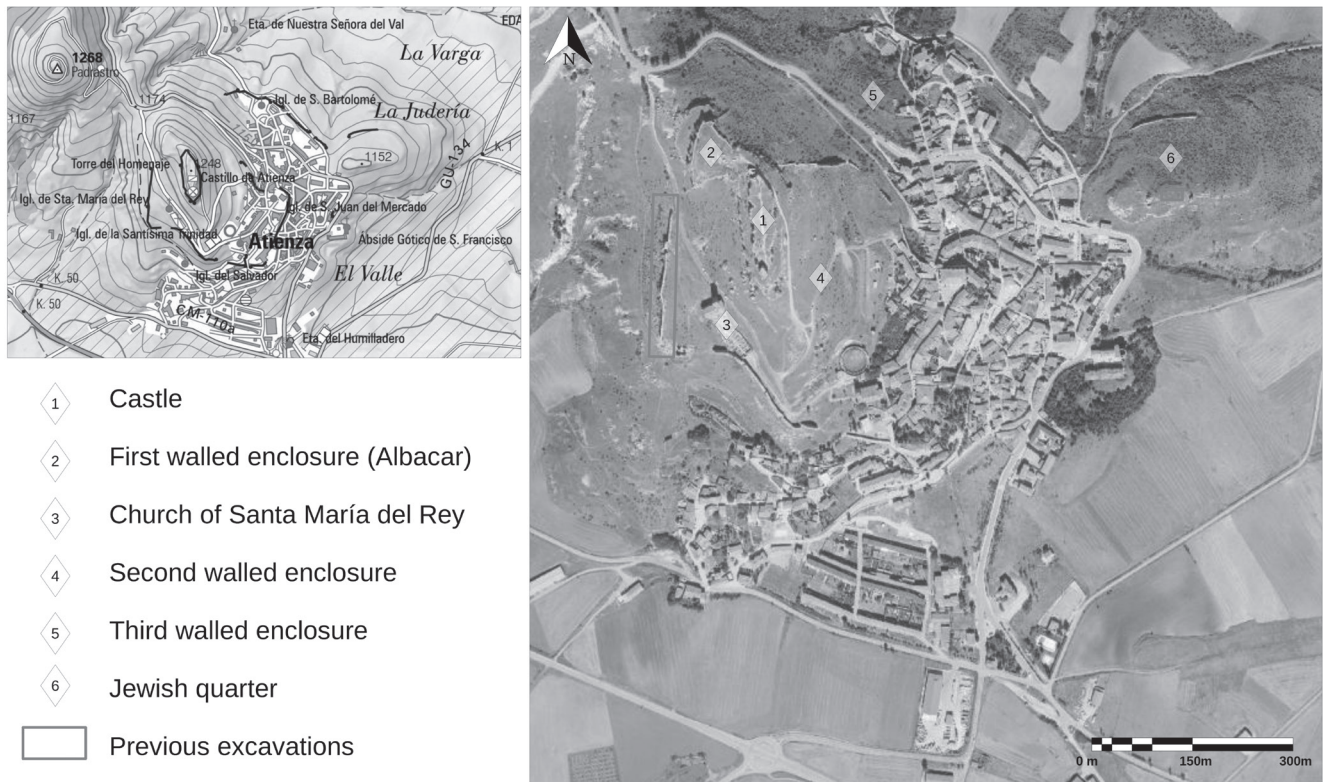


Fig. 3.13. Localisation of Atienza showing key features and areas of previous excavations

the two hills, that of the castle and the Cerro Padrastró, relocating to the eastern slope after the Castilian conquest, when the different parts of the wall were constructed. The original fortification must have been situated on Cerro Padrastró, and from the 10th century the rocky platform on which the castle is located today began to be developed and remained fortified until the modern period.

It is quite likely the Andalusi population was clustered around the fortification, which would explain the lower density of Andalusi settlements in the surroundings of Atienza, in contrast to other parts of the province of Guadalajara (García-Contreras 2016a, 2016b). After the Castilian conquest, the site continued to be occupied and was heavily transformed, although no study has considered this in detail. It is probable that the Tower of Homage dates from this period, although more than one phase is suggested by its structure, and it is likely that a keep was added. The written sources for the castle in Atienza refer to various buildings that served its inhabitants, but aside from the two cisterns, the keep and the walls that surround the complex, the internal constructions and subdivisions of space within the castle remain unknown. It is entirely possible that some buildings functioned solely to house mustering troops or to serve the population as a refuge, so for much of the time they would have remained empty.

Following geophysical surveys (Fig. 3.14) a trench was opened in 2021–2022 in the *albacar*, revealing a series of rock-cut pits, interpreted as silos for storage of agricultural produce (Fig. 3.15a–b). In their final period of use the silos had been used for domestic waste, which included fragments of metal, animal bone (including bone objects) and ceramics. Radiocarbon dates of bone and charcoal indicated the final deposits were from the late 8th–9th century. This was also confirmed by the dating of associated ceramic fragments.

#### THE URBAN AREA OF ATIENZA

Previously, the urban area of Atienza had only seen small-scale excavations in the so-called ‘Jewish settlement’. This is one of two areas of the medieval town which were the focus of excavations within the framework of this study (Fig. 3.16) (Mattei *et al.* 2024). The former Jewish settlement is located on a separate hill outside the walls of the medieval town. The crest of the hill was built up with dense housing and the entire settlement which extended to its base was enclosed by a set of walls and gate houses. Fragments of these survive above ground, particularly a lengthy section of wall (Fig. 3.17). The second urban area was defined as the Andalusi settlement on the basis of finds of ceramics associated with a walled structure, by the church of Santa María del Rey, dating to the 9th century. They suggest one



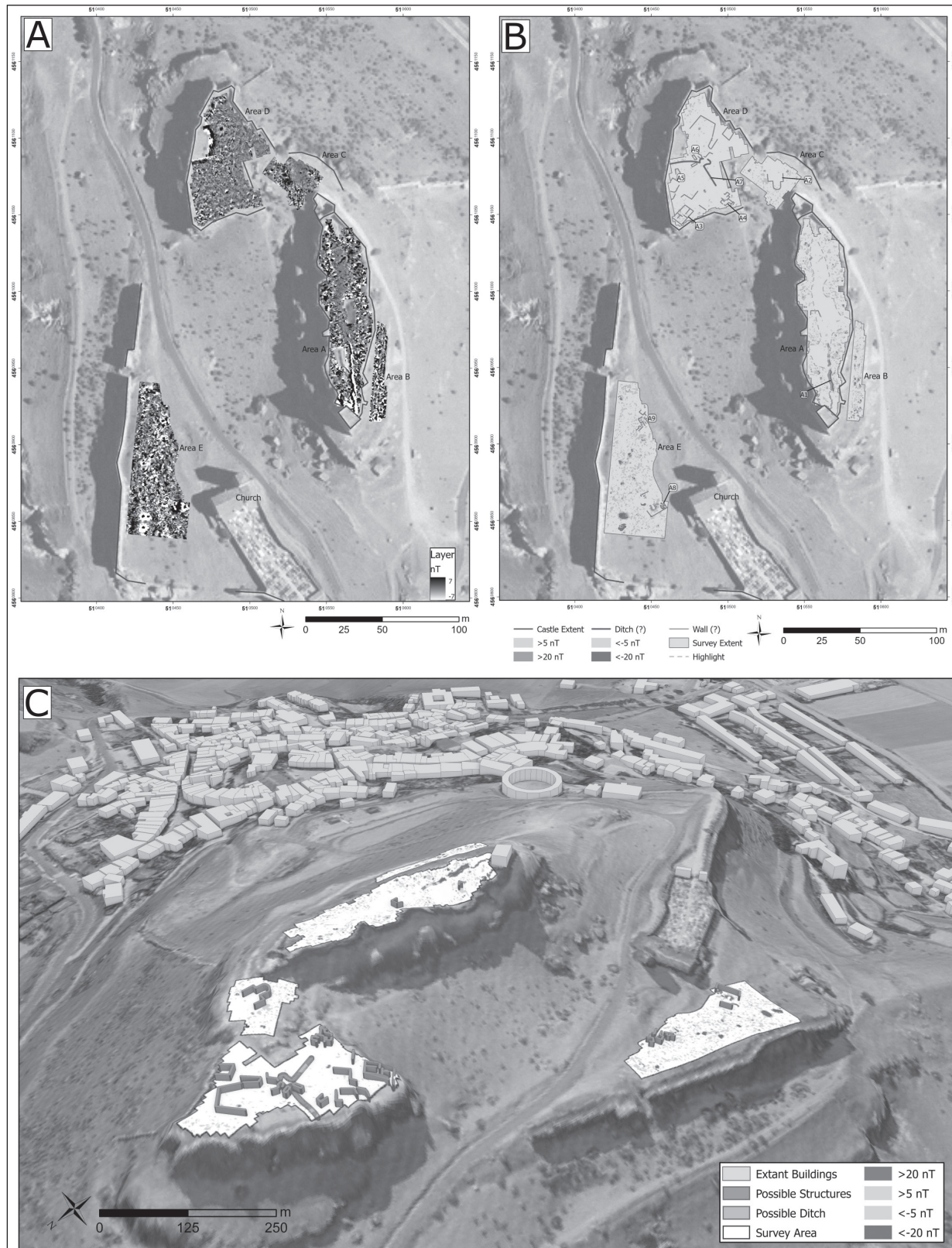


Fig. 3.14. Magnetometry survey and interpretation of anomalies within the grounds of the castle of Atienza (Rob Fry/National Geographic Information Center of Spain CC-BY 4.0, OpenStreetMap, EDINA Global Digimap Service)





*Fig. 3.15. Silos excavated in the albacar of Atienza castle*



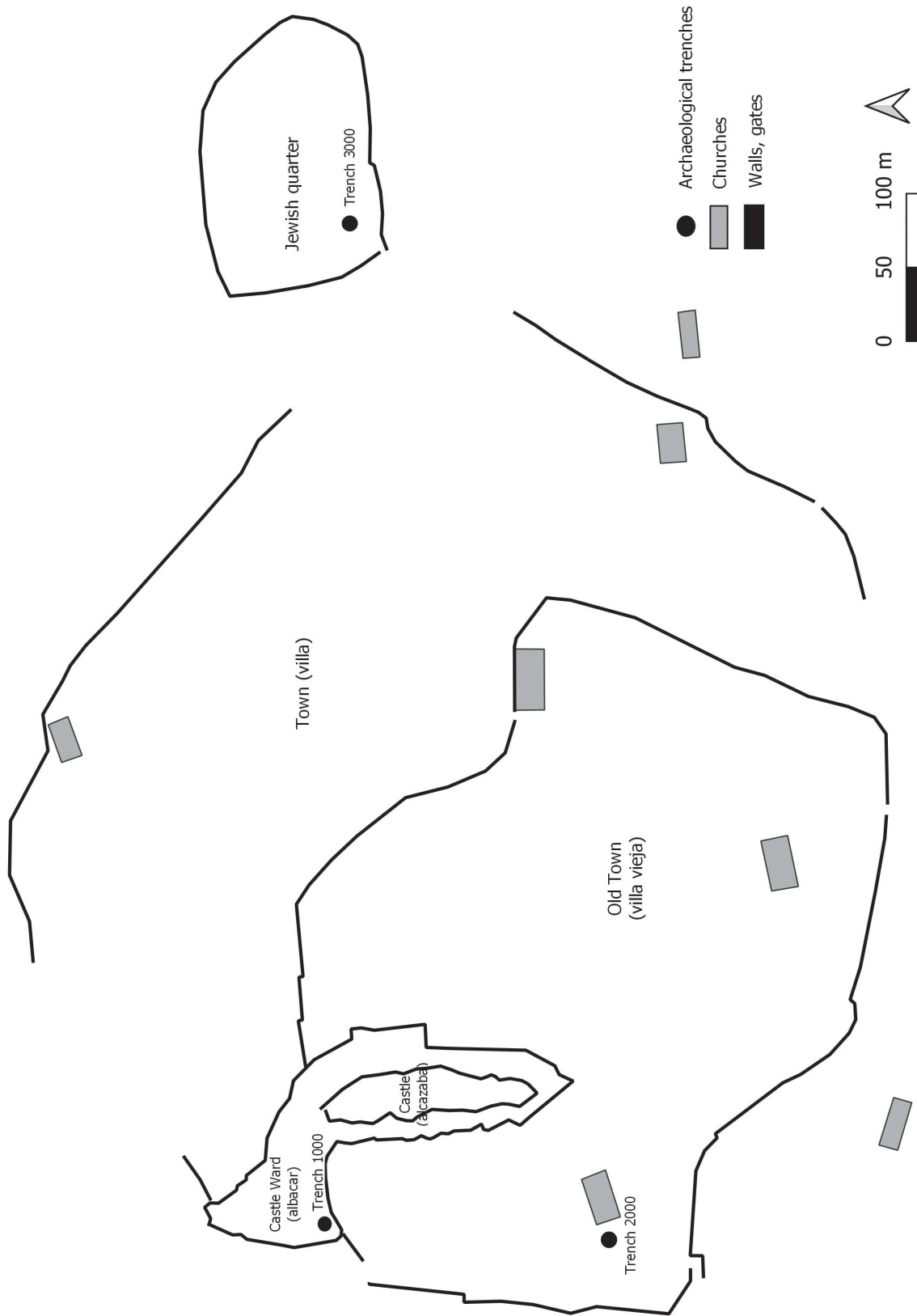


Fig. 3.16. Plan of excavations at Atienza associated with this study



Fig. 3.17. Excavations in the Jewish quarter in Atienza

location for the Andalusí settlement associated with the *madīna* before the Christian conquest. The church itself is Romanesque and contains a unique inscription in Latin and Arabic (Kufic script), both of which refer to the ‘presence of God’ (Fig. 3.18a–b). In 2021–2022, a trench was opened by the church which uncovered part of a structure represented by a substantial wall, as well as ceramics and animal bone fragments (Fig. 3.19a–b). A bone fragmented radiocarbon dated to c. 890–1020 AD (95.4%), as well as the associated ceramic assemblage, confirmed the presence of an Andalusí settlement before the Castilian conquest. Features dating to the Bronze Age were also uncovered, with a hiatus in occupation until the Andalusí period.

### Secondary sites: Guadalajara

Secondary sites in the province of Guadalajara consisted of the towns of Guadalajara and Sigüenza, from which faunal assemblages and human remains in museum collections were made available for further study. Excavated human remains were also made accessible for further analyses from the castle of Zorita de los Canes.

#### Guadalajara

The town of Guadalajara, situated in the valley of Henares, was established by the 9th century and in Arabic sources it is variously named *Madinat al Faraʿ* or *Wādī-l-Hiṣāra*. Archaeological evidence indicates the development of multiple

areas of settlement and economic activity, including an administrative district with an *alcázar*, during the Caliphal and taifa periods when it was controlled by the Banū Sālim (Cuadrado Prieto and Crespo Cano 2018). Following Alfonso VI’s conquest of Toledo in 1085, Guadalajara surrendered to Castile. The town came under royal control and in 1133 received the first of several *fueros* as it expanded, following an influx of northern migrants. Numerous excavations have taken place across the historical centre of Guadalajara with materials stored in the regional museum. Human and faunal assemblages were recorded and sampled for isotopic analyses from four sites within the urban area: fauna samples from Palacio de los Guzmán (Cuadrado 1992), representing Andalusí occupation phases, and the later medieval Castilian palace of Alcázar Real (Crespo and Cuadrado 2002); and human samples from the municipal cemetery of the city (Vara and Martínez Peñarroya 2017) and Campus de las Cristinas (Caballero and Agustí 2021).

#### Sigüenza

The town of Sigüenza, situated on the Henares river, has a multi-occupation history, starting as a Roman settlement which developed into an episcopal seat in the Visigothic period. An Andalusí *hisp* was established here in the 8th century, aimed at controlling this stretch of the Henares valley. In 1124, the French bishop of Toledo, Bernardo de Agén, stormed the castle with a Castilian army. Alfonso VII





Fig. 3.18. The portal of the church of Santa Maria del Rey, Atienza



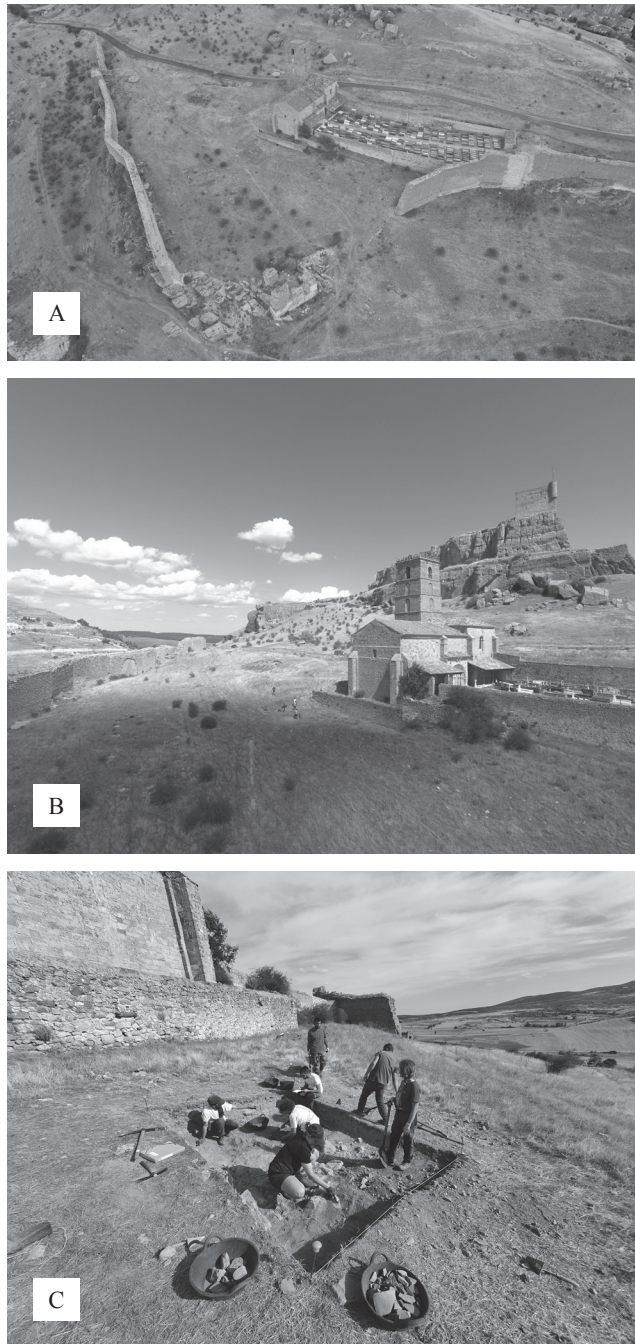


Fig. 3.19. Excavations by the church of Santa Maria del Rey, Atienza

granted Sigüenza to the bishop along with an associated territory with abundant natural resources (García-Contreras 2014, 2025), which became the centre of an episcopal territory (Sevilla Muñoz 1985). Bernardo and later bishops invested in developing the town, constructing its cathedral, parish churches and walls (Fig. 3.20). The Andalusi fortification was also rebuilt as their principal residence. Human remains were sampled for isotopic analyses from the cemetery around the cathedral (Cardín and Cuadrado 1998).

### Zorita de los Canes

This castle was constructed some 800m from the Visigothic city of Reccopolis, in a strategic location overlooking a crossing on the middle Tajo river. It was also situated on a well-connected road network linking Toledo with Zargoza. Reccopolis remained an important centre in the 8th and 9th centuries, but in the mid-9th century, the Andalusi settlement of Zorita replaced it as the regional centre, and expanded in the 10th century with the addition of new walls. A castle was built with an *alcazaba* and became the power centre for the Berber Band Dil-Nun. Both the town and castles were constructed from the dismantled building materials of Reccopolis. Between 1085 and 1124 the castle passed between Muslim and Christian ownership and in 1174, it was finally granted to the Order of Calatrava by Alfonso VIII of Castile. The Order significantly expanded the castle, essentially remodelling it as a fortified monastery (Fig. 3.21) (Ayala Martínez 2003; Urbina and Urquijo Álvarez de Toledo 2022). Zorita would serve as the Order's headquarters between 1195 and 1212, but the town retained its role as a regional centre until the 15th century. From 2014, excavations have taken place inside the castle under the auspices of American Foreign Academic Research (AFAR) and ArchaeoSpain, particularly focusing on the cemetery south of the 12th-century church of San Benito. Here, human and animal remains dating to the Order's period of occupation were discovered which were made available for this study.

### Environmentals sites: Guadalajara

#### LAKES

Sediment cores were obtained from the lakes of Setiles, Lagunilla Lana (La Yunta) and La Lagunilla (Zafra) and Tordesilos. Virtually no pollen was preserved in the first three. The sediment from Tordesilos contained suitably preserved pollen, but the sequence turned out to be prehistoric. As a result, published pollen profiles from lakes in the north-western part of the province have been included in this study (Currás 2012; Currás *et al.* 2012) (see Plate 5.11).

#### MINES

The mountain ranges of the province of Guadalajara are rich in primarily iron and copper, and these metals have historically been extracted from a number of mines. Today, these mines lie within the UNESCO Molina-Alto Tajo geopark. With the geopark's permission and supervision, three mines were sampled by Yaiza Hernandez for ores, in order to determine whether they were exploited during the medieval period. Samples obtained from these mines were compared with metal objects recovered during the project's excavations and held within museum collections. The three mines were Las Majadillas for iron and La Estrella for



Fig. 3.20. Sigüenza

copper and silver, both within the Sierra de Pardos, and the mine of Setiles in the Sierra Menera for iron. They are discussed in more detail in Chapter 10.

## Andalusia

### Geography

The autonomous community of Andalusia covers a large part of southern Spain and is defined by a series of W–E mountain ranges. To the north the Sierra Morena separates the region from the Meseta Central and in the south the Baetic system encircles the Guadalquivir valley. The Baetic System is composed of three smaller systems of mountain ranges (the Prebaetic, Subbaetic and Penibaetic ranges), which includes the highest point on the peninsula, Mulhacén in the Sierra Nevada, standing at 3478m.a.s.l. Between these mountain systems, in some areas, large plains stretch out providing fertile agricultural lands such as those around Antequera, Granada and Guadix (Fig. 3.2). Another peculiarity that characterises Andalusia is the presence of steep reliefs in close proximity to the coastline, with a mountainous landscape that drops directly into the sea, especially in the modern provinces of Malaga and Granada. These coastal spaces are connected with the region's plains by three expansive natural corridors that served as the backbone of medieval communications in the region: Guadalhorce, Guadalfeo and Fiñana.

### Historical background

Following the Arab-Berber conquest of much of Iberia, the region became the core of Umayyad al-Andalus, with the emiral and later caliphal centre at Córdoba. During the third taifa period, the region fragmented once more into smaller polities, one of which emerged as the emirate of Granada, ruled by the Banū Naṣr or Nasrids. The foreign policy of Fernando III, King of Castile (and from 1230 also León) was marked by the annexation of the Guadalquivir valley and the cities of Córdoba (conquered 1236), Jaén (conquered 1246), Seville (conquered 1248), the taifa of Niebla (annexed 1262) and the taifa of Murcia (annexed 1266). This dramatic process of expansion saw the creation of a new and long-lasting frontier with the emirate of Granada, which became a vassal state of Castile (Fig. 3.22).

In 1246, the border was defined in the Treaty of Jaén (or 'the Great Peace' in Arabic sources) as running through the Subbaetic mountain range (Boloix-Gallardo 2022). The terms of the treaty emphasised the defence and security of the frontier, and as result of this the Castilian term *frontera* was adopted into Arabic texts where it was rendered as *furuntayra*, alongside the traditional term *thaghr* (Boloix-Gallardo 2020, 63–65). Subsequent Castilian attacks across the western and northern frontier of the emirate of Granada in the early decades of the 14th century saw





*Fig. 3.21. Zorita de Los Canes (Oilisab, Wikimedia Commons)*

the incremental annexations of towns and fortifications, particularly during the reign of Alfonso XI (1312–1350). The War of the Strait of Gibraltar (1291–1350), between Castile and an alliance of the Nasrid emirate and the Marinids, resulted in the eventual loss of Gibraltar to the Catholic kingdom. It also ended North African military involvement in the Christian-Muslim conflict in Iberia. In the latter half of the 14th century, there were occasional raids across the frontier, but in general the borderland remained stable. In the 15th century, there was a shift in Castilian political attitudes towards the Nasrid emirate and a revival of crusader fervour (Rodríguez-Picavea 2010). The extended ‘Granada War’ was marked by the military campaigns of Fernando of Antequera (1407, 1410), the crusade of La Higuera (1431), the crusade of Enrique IV (1455) and the final conflict of 1482–1492 which culminated in the conquest of the Nasrid capital. During this time, the frontier moved incrementally as key castles and towns were taken (Fig. 3.22). The conquest was followed

by the gradual reorganisation of Nasrid society in line with Castilian governance, religious and social norms (Ladero Quesada 1993, 2002; Galán Sánchez 2000).

### *Archaeology*

There is a long and diverse history of archaeological research within Andalusia (Malpica Cuello and García Porras 2011), where significant numbers of sites dating to the Andalusi and Castilian periods have been excavated. Scholarship has focused on the early settlement of the region and its political centre in Córdoba (León-Muñoz 2019), as well as on various aspects of the Nasrid emirate (García Porras 2010; Malpica Cuello 2012), with some investigations of the brief phases of taifa rule (Sarr 2011). The region contains the most important urban monuments from the Andalusi period, including the townscape and cathedral-mosque of Córdoba, the cathedral (former great mosque) of Seville and the Alhambra in Granada. Important urban excavations have taken place in Córdoba, Jaen



and Granada (Abdel Hadi 2022). In the Vega of Granada, significant work has been conducted at the first Andalusi urban centre of Medina Elvira (Malpica Cuello 2010; García-Contreras *et al.* 2022). There has also been extensive work on rural settlement and the use of the landscape in the Andalusi, and particularly Nasrid, period. In recent decades the cultural landscape of the medieval frontier has become a key theme in archaeological research, particularly the role of fortifications (Malpica Cuello 1999–2000, 2000, 2003; Rodríguez 2004; Mattei 2013; García Porras 2014; Quesada-García and García Pulido 2015). The establishment of the frontier in the 13th century, and its reorganisation in the mid-14th century, saw renewed investment in existing fortifications, as the role of earlier *huṣūn* changed (e.g. Mattei 2011; Pedregosa Megías 2012). The expansion of these castles, in turn, resulted in higher population densities clustered around frontier centres in a process that has been referred to as a form of *incastellamento* (Quesada Quesada 1993). However, some rural (*alqueria*) towers appear to have been constructed by peasant communities in response to internal rather than external threats (Fábregas García and González Arévalo 2015). The transformation of castles and towns by the Castilian regime has also been explored from archaeological perspectives, within the context of their

long-term site biographies (e.g. Pedregosa Megías 2012; Cobos Rodríguez 2016).

This study has two foci in Andalusia. Firstly, the north-western and western frontier of the emirate of Granada which lies within the modern provinces of Granada, Málaga and Jaén. Secondly, the hinterland of Granada and how it was affected by the Castilian conquest. In the case of the latter, the focus is on the comparatively short-lived frontier society created by the process of regime change and societal transformation.

### Primary sites: Granada

#### Cartuja

Excavations across the Cartuja campus of the University of Granada have uncovered multi-phase occupation dating from the Neolithic to the present day, with a significant Roman industrial presence at the site, after which there was small early medieval hamlet and a necropolis that was abandoned in the 9th century (Figs 3.23, 3.24) (Román and Carvajal 2018; Román 2020). During the Nasrid period the area, known as the ‘estate of Aynadamar’, was intensively settled with *cármenes*, a type of suburban property consisting of a house and agricultural land and *almunias*, larger



Fig. 3.22. Map of the Emirate of Granada and its frontier (Amitchell125, Wikimedia Commons)

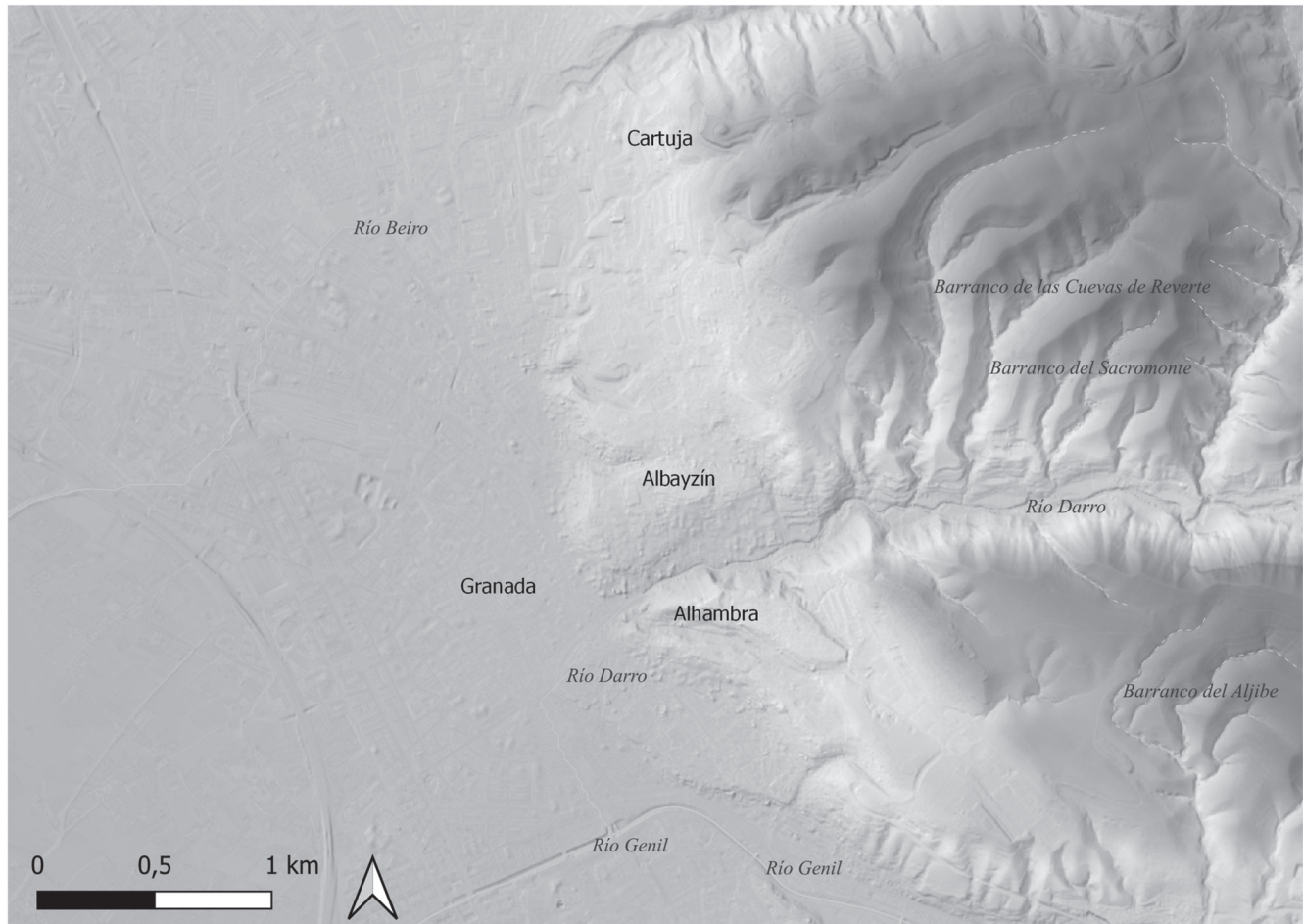


Fig. 3.23. Topographic location of Cartuja in relation to Granada

elite properties (Trillo 2003; García-Contreras *et al.* 2017, 2020; García-Contreras Ruiz 2020b, 2020c). The landscape changed radically after the Castilian conquest in 1492, when the area was progressively acquired by Christian migrants, Italian merchants and the Carthusian Order. The latter built a monastic complex with a church and enclosed all their properties in the area, which came to be known as Cercado de Cartuja (Turatti *et al.* 2016; López and Díez 2017; Díaz 2019). Nonetheless, written sources indicate that some of the Andalusí residents (Mudéjares and later Moriscos) and their descendants continued to inhabit and use the *cármenes* of Aynadamar in the decades after the conquest (Torres 2007).

In two excavation areas (29,000 and 24,000) on a rocky outcrop west of the current Faculty of Philosophy and Humanities, a Nasrid-period domestic structure and an adjacent infilled well were uncovered (Fig. 3.25). The structure consisted of at least one room, an open courtyard paved with bricks and an additional room with a small hearth. The house was occupied between the mid-14th century and the

mid-16th century, and was abandoned when the surrounding agricultural land was reorganised (García-Contreras *et al.* 2020). When the well stopped being used for drawing water, it was filled with soil, ceramics and an assemblage of animal bone representing food waste. This was then sealed with discarded construction materials. The ceramics were late Nasrid forms, with no Castilian pottery present, and it became clear this waste was dumped in a single episode and could be dated to the second quarter of the 16th century (García-García *et al.* 2021). The assemblage, included within this study, has provided a valuable insight into the impact of the Castilian conquest on a peri-urban community in Granada.

### *Agicampe*

The tower of Agicampe and the associated farm buildings are located on the southern slopes of the Sierra de Alamedilla, north-east of Loja (Granada), in close proximity to a spring (Fig. 3.26). There is evidence in the vicinity for occupation dating from the Roman period, perhaps through to the early



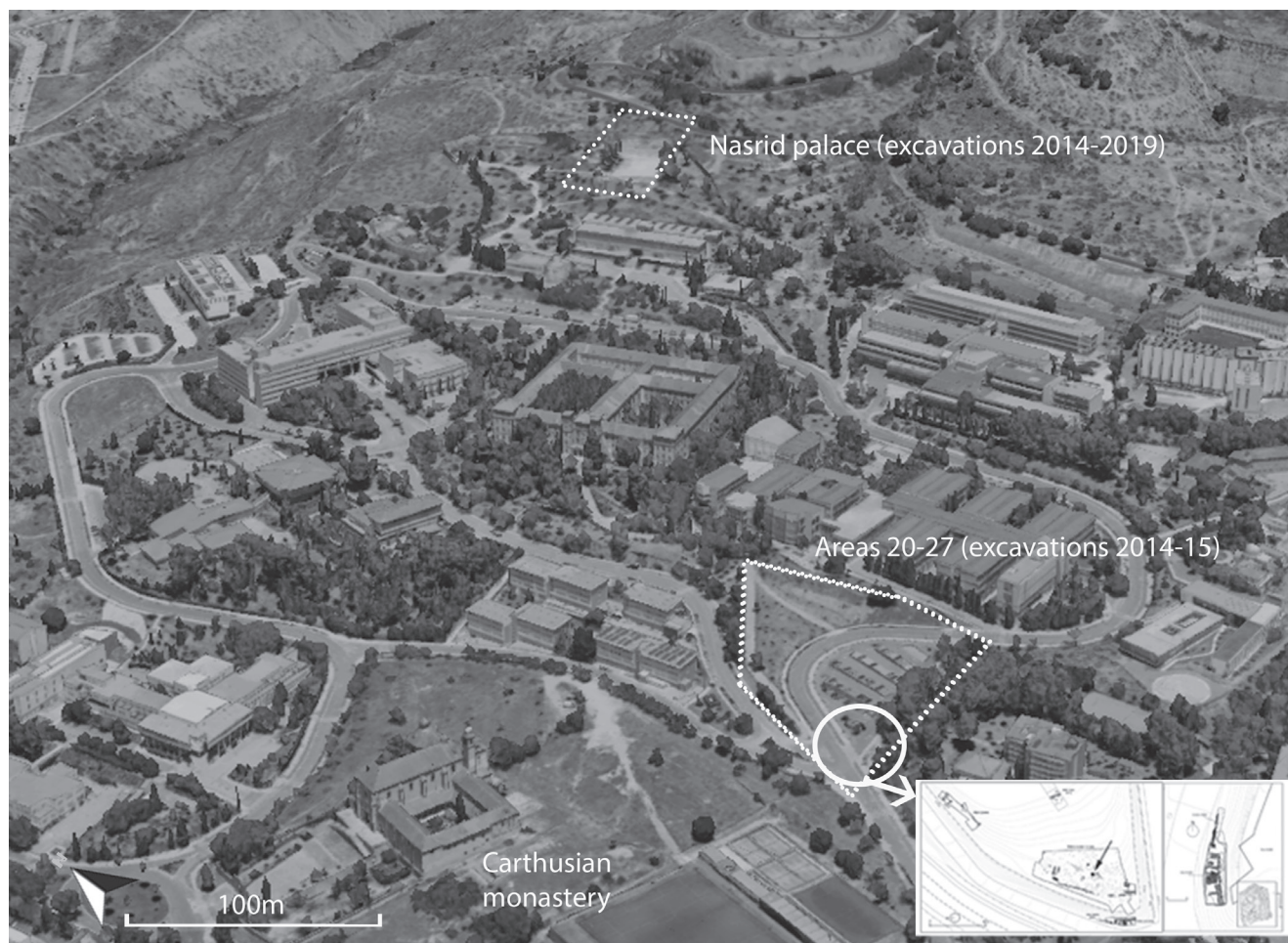


Fig. 3.24. Locations of the excavations in the University of Granada campus in Cartuja, Granada (Map data: Data SIO, NOAA, U.S. Navy, NGA, GEBCO. Image: Landsat/Copernicus)

Andalusi period when a large rectangular building was constructed (García Porras and Alonso Valladares 2022). The site is mentioned in the 8th century under the name of Šikanb, and an irrigation system nearby has been attributed to Arab settlers of Yemeni origin. Ceramic scatters within the vicinity of the farm can be dated from the 12th to 16th centuries, although the tower itself was most probably built in the mid-14th century during the reorganisation of the Nasrid-Castilian frontier (Jiménez Puertas 2002). At this time, the adjacent area of cultivation may have been expanded. This fortified *alqueria* continued to be used after the Castilian conquest, when it is mentioned in Loja's *Libros de los Repartimientos* (Barrios Aguilera 1988). However, the tower and some of the associated buildings were partially dismantled in the 16th century, most likely reflecting the edict of the Castilian regime which ordered the demolition of towers in the region. Two seasons of excavations led by Alberto García Parras took place around the tower and in the adjacent field in 2018, alongside a programme of coring. The lower levels of cores taken from the field closer to the tower recovered ceramics

dating to the Nasrid period, whilst a trench uncovered the buried remains of a terrace which had been cultivated at this time (Fig. 3.27) (García Porras *et al.* 2020).

### Primary sites: Málaga

#### Cártama

The settlement at Cártama (Málaga) was founded by the Phoenicians and developed into a fortified town during the Roman period. Located on the Guadalhorce river, it was strategically located on the main route linking the coast and the interior. Authors such as al-Jusānī or Ibn al-Faraḍī describe Cártama as one of the districts – *Iqlīm* – which became quickly Islamised following the settlement of Yemeni Arabs who sought out urbanised areas and fertile agricultural lands (Martínez Enamorado 2003, 425–426). As a result, they reoccupied the old political-administrative centre which had endured in the late antique period, as attested in the archaeological excavations carried out in the current Plaza de la Constitución (Fig. 3.28) (Melero



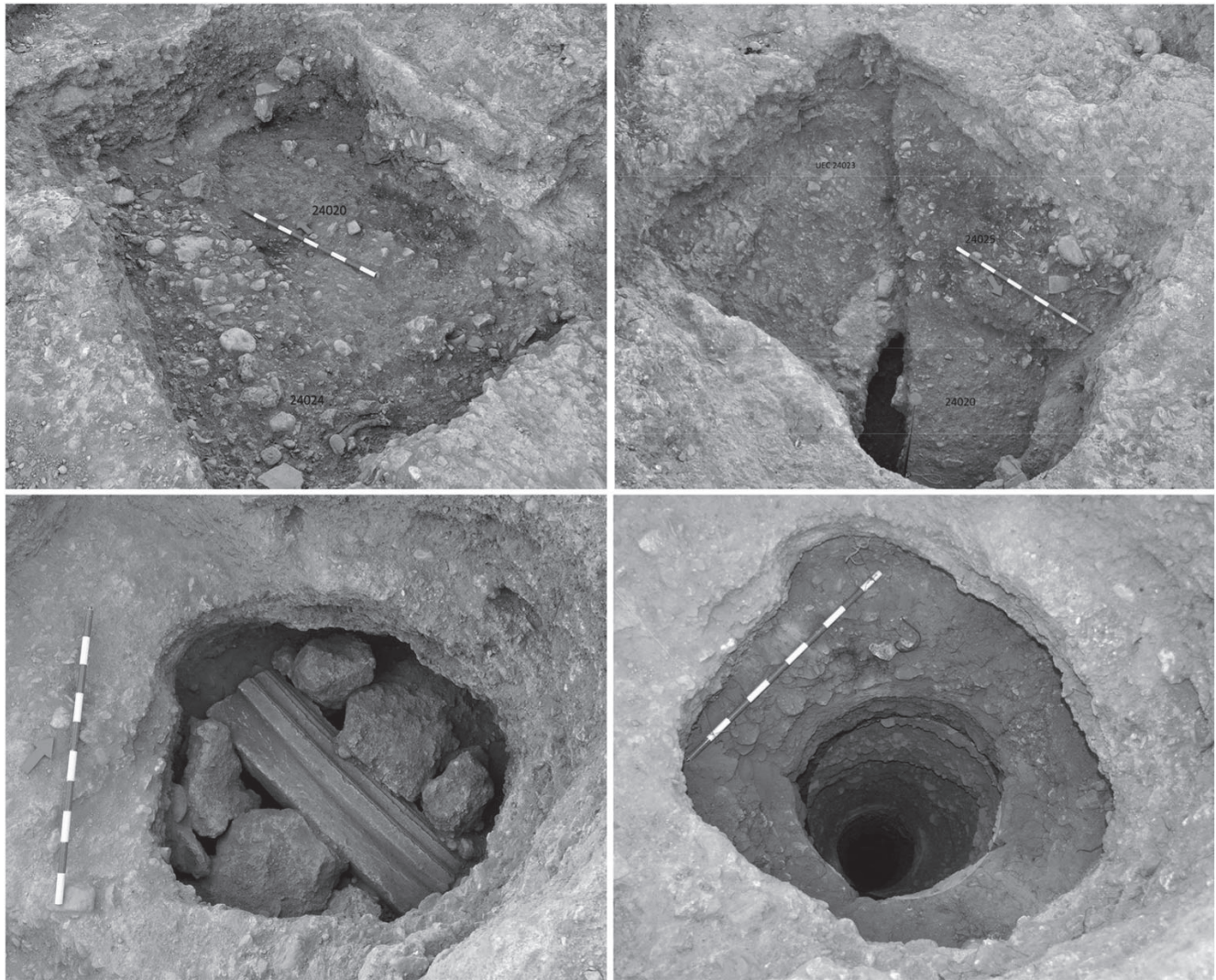


Fig. 3.25. The excavated well showing stages of infilling in Cartuja, Granada

García *et al.* 2006, 533). The castle located on an outcrop above the town was built in the 9th century and expanded in the 14th century, when it controlled access to the port of Málaga as the western Castilian-Nasrid frontier was redefined. The castle and town were conquered by Castilian forces in 1485, in the same year as Marbella was taken and the frontier moved significantly to the east. Excavations from 2005–2007 in the Plaza de la Constitución, below the castle, identified substantial peri-urban deposits (Fig. 3.29). These were interpreted as a landfill used throughout the Andalusí period. The deposits included wells with ceramic assemblages dating from the 9th to 15th centuries (Melero García 2009, 2012). Excavations from 2019 uncovered further medieval features, including a pit dating to the early 13th century or Almohad period, and materials from these were made available for this study.

## Secondary sites: Granada

### Moclín

Moclín castle is without doubt one of the best preserved examples of an urban fortress located on the former Castilian-Nasrid frontier (Fig. 3.30). Located in the Western Mountains of Granada, it was of great strategic value offering a directly visible connection to Granada, controlling the route to Alcalá la Real (Fig. 3.31), and defending one of the natural entrances to the Vega de Granada, the valley of the Río Velillos. The fortress town of Moclín is made up of two walled areas that are clearly differentiated from each other. The upper one, located at the highest part of the hill, consists of the citadel. Here there are two lines of walls, several cisterns and a prominent fortified residence – the Torre del Homenje. The second enclosed area is adapted





Fig. 3.26. The tower at Agicampe

to the local topography and encompasses a large area on the southern slope of the elevation and which was occupied by domestic dwellings (García Porras 1998; García Porras and Bordes García 1999). It has a zipper-shaped wall and some elongated semicircular towers, with a prominent gate tower that has been investigated archaeologically (García Porras 1999). Recent archaeological excavations in the area of the *alcazaba* have demonstrated the castle functioned from the 12th century through to the beginning of the 16th century, when it was permanently abandoned. There are also material traces that suggest the hill was occupied from at least the 11th century (García Porras 2014).

### **Secondary sites: Jaén**

#### *Alcalá la Real*

In the medieval period, Alcalá la Real was of great strategic importance in the southern part of the Iberian Peninsula, especially due to its frontier location when it

served as a Christian base for launching attacks on the Nasrid emirate. It was an Andalusi fortification from a very early period, and is documented in sources with different names depending on the ethnic group that governed it, although always preceded by the Arabic word *Qal'at*. It was firstly referred to as Qal'at Astalir, then as Qal'at Yahsub and finally as Qal'at Banu Said, then its name is recorded in Christian chronicles as Alcalá Benzayde (Cano Ávila 1999; Escudié Lacroix 2016–2017). The complex consisted of three enclosed areas. In the highest part of the outcrop stood the *alcázar*, a defensive enclosure with a trapezoidal shape, whose interior access was controlled by a gate located in the lower part of the Homenaje tower (Fig. 3.32) (Castillo Armenteros 1997). Then there was the *alcazaba* which may have had up to seven gates (Eslava Galán 1999). Lastly, the outermost enclosure was formed by the defences of the *medina*, which included its suburbs. In 1341, Alfonso XI conquered Alcalá la Real using artillery. In the 16th century, the fortifications of





Fig. 3.27. Sampling an excavated buried terrace at Agicampe

the *alcázar* were rebuilt, and a monastery was established on the hilltop with a church dedicated to Santa María la Mayor. By the end of the 16th century the slopes began to be permanently settled. In 1560 the area of ‘La Mota’ was populated by around 200 residents, whilst beyond its walls there lived some 2000 inhabitants. The fortified complex on the hill was finally abandoned in the 18th century.

### Towers

Alongside the presence of fortified towns, the Nasrid border was punctuated by a number of towers, the remains of which are still preserved on the most strategic hilltops of the former borderland. They were built as auxiliary defences for the larger fortified complexes and to control the main communication routes through the frontier. This defensive network was not created during a single programme of construction, but rather developed in an organic way over time as the frontier shifted. The Andalusi towers were cylindrical structures built from stone, with heights ranging 10–12m. Their entrances were almost always through a window door located a few metres above the ground, through which one accessed a room with a covered vault. This served as a refuge from

which warning signals could then be sent to other watchtowers and fortified centres (Fig. 3.33) (Mattei 2023). On the other side of the borderland opposing the defensive system of the Islamic watchtowers, in the vicinity of those Christian fortified complexes which stood in a relatively stable frontier zone, such as Alcalá la Real, watchtowers were also built that clearly differed from their Nasrid counterparts (Arjona Castro 1990). They consisted of cylindrical structures built of ashlar, and standing at an approximate height of 13–14m. At the base of these towers, a truncated cone-shaped buttress was constructed that considerably increases their outer diameter. On their upper levels machicolations were added and corbels were arranged in the manner of a circular balcony, facilitating maximum visibility from the top of the building (Fig. 3.34). These structures remained relevant as long as they were situated in a frontier zone. Once this shifted they effectively became redundant.

### Secondary sites: Málaga

#### Teba

Teba is located at the exit of the pass that the Serranía de Ronda makes through the fortresses of Las Cuevas del Becerro, Priego and Cañete la Real. To the north it opens to the countryside that borders the Guadalquivir valley, with the fortresses of Osuna and Estepa as prominent bordering enclaves. Towards the east, the continuation of the valleys of the Surco Intrabético puts it in contact with Antequera. Finally, to the south it borders the mountains of Valle de Abdalajís and Chorro, on the other side of which is the Valle del Guadalhorce. The oldest source dating to 1002/1003 refers to a farmhouse called Itaba/Atiba in the Tākurunna district (Vallejo 1986, 286). Despite this written document, the farmhouse cannot be linked to the specific location of the fortress at Teba, because the ceramic materials found in the castle do not date before the 12th century. In the 13th century it was mentioned as a *tagr* and as a border castle and town (Martínez Enamorado 1998, 74), indicating the existence of a consolidated population centre in the frontier. The region was conquered in 1330 by Alfonso XI, providing a foothold for the Castilian kingdom in Nasrid territory that would last until the end of the conflict. The interior of the area enclosed by the outer walls occupies around 2.5 hectares, and is dominated by the citadel building where the Torre del Homenaje is located, a high-status residence, and the adjacent parish church which was excavated in 1990–1993 (Fig. 3.35) (Fernández Guirado 1995–1996). A georadar survey enabled the dense archaeological traces of residential constructions to be mapped within the urban area around the tower (Alcántara Vegas *et al.* 2018). The walls of the enclosed area are characterised by examples of rammed earth cores that could date to the Almohad period and





Fig. 3.28. Excavations at Plaza de la Constitución, Cártama

that appear embedded in and fortified with other masonry structures (Fig. 3.36).

#### *Antequera*

The origin of Andalusian Antequera is linked to ancient Roman Antikaria. The oldest reference refers to it as a *ḥiṣn*, which must refer to a fortified nucleus that would control a rural territory populated by Yemeni Arabs (Martínez Enamorado 2003). After being cited as a fortress in the border context of the taifas of Granada and Seville during the 11th century, in the 12th century, the Ceutí al-Idrisī already cites Antequera as both a *madīna* and as a *ḥāḍira*, the latter term possibly interpreted as the capital of a territory (Martínez Enamorado and Romero Pérez 2010, 55). The enclave almost always had a frontier character, which would continue in the Nasrid era when it was located in the borderland with Castile. The development of the Roman city of Antikaria from the 1st century

onwards is very clear, while there is no archaeological evidence to date for the Andalusian settlement prior to the 10th century (Navarro Luengo *et al.* 2001). From then it becomes visible, and especially from the 11th century, with uninterrupted continuity until the conquest in 1410 (Fig. 3.37). The appearance of Nasrid Antequera is that of a small but strongly walled town that consisted of two enclosures (Gurrarián 2010). On the one hand the citadel, and on the other the *medina* with its three main gates (Málaga, Estepa and Granada). Archaeology and written sources do not provide any evidence of suburbs, while the presence of orchards has been documented outside the walls from at least the 11th century through to after the conquest (Fernández Martín 2011; Melero García *et al.* 2018). Following this event, and with the development of a new society under Christian governance, the landscape of the surrounding region noticeably begins to change (Cobos Rodríguez 2021).

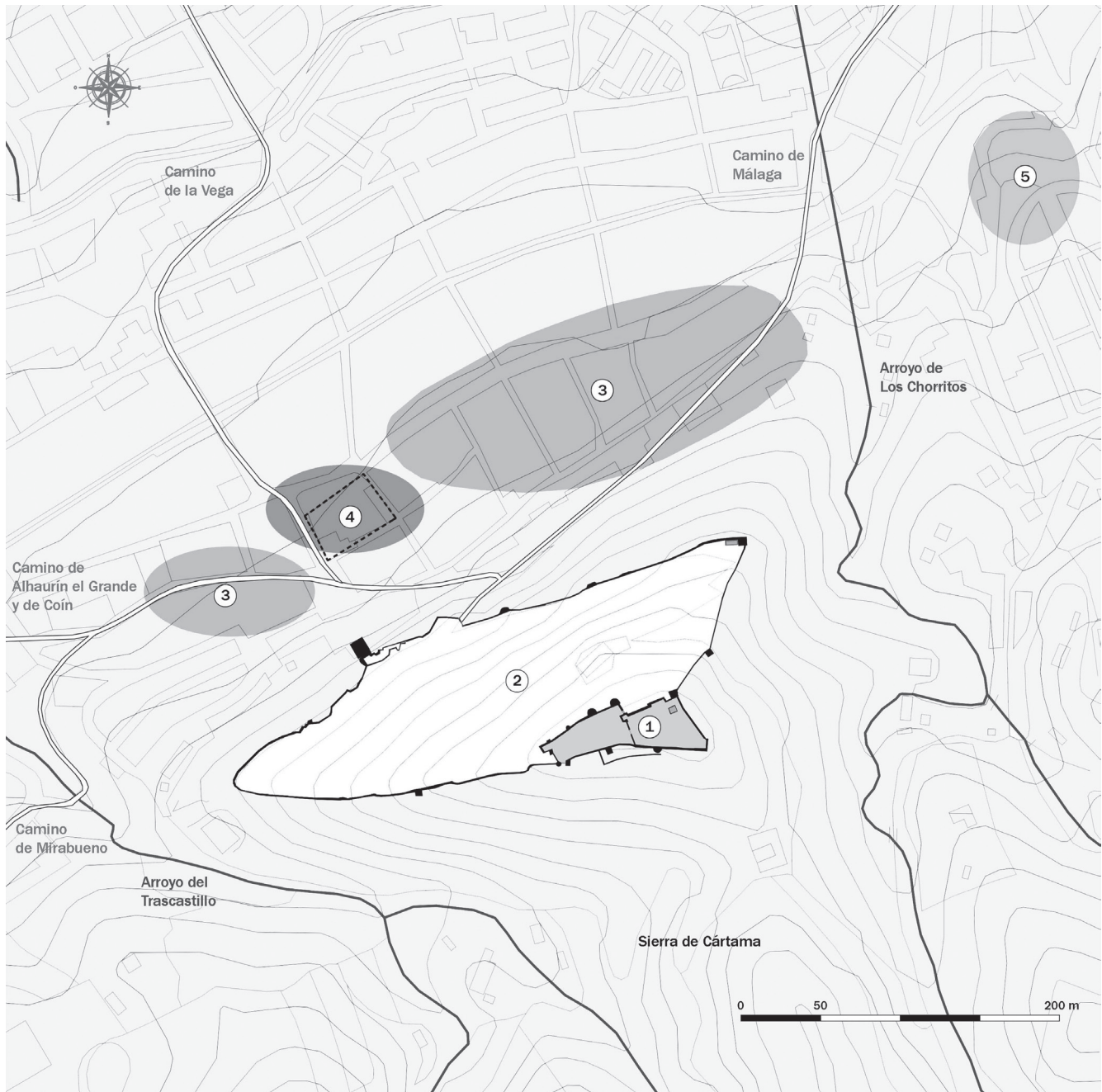


Fig. 3.29. Plan of Cártama, showing the excavation area (4) under the castle

Located 300m north-east of Antequera is the area known as La Moraleda. Excavations in 2011 indicated the area played a marginal role in relation to the adjacent urban conurbation. During the Almohad period it was subdivided into areas with orchards, watered by the Valdealanes irrigation canal, but by the Nasrid period these had been abandoned. The area was then used for landfill between the last quarter of the 14th century and the first decade of the 15th century (Alonso Valladares and Garrido-García 2015).

### Archidona

The current Andalusian fortified area is located north of the urban area of Archidona, surrounding the emblematic Cerro de la Virgen de Gracia. The fortification in question consists of a citadel adapted to the natural configuration of the summit, from which it overlooks an urban area bounded halfway down the slope by a powerful wall. References to Andalusian Archidona are abundantly present in written sources from an early





*Fig. 3.30. Moclin castle*



*Fig. 3.31. View from Moclin towards Alcalá la Real, overlooking the historical frontier*





*Fig. 3.32. Alcalá la Real*



*Fig. 3.33. Torre de la Porqueriza o de Tozar, Granada (<https://www.xn--castillosdeespaa-lub.es/>)*





*Fig. 3.34. Torre de la Moraleja, Jaén (Antonio Vázquez Cañadas, Wikimedia Commons)*



*Fig. 3.35. Teba castle*





Fig. 3.36. Remnants of tapial in Teba castle

period. It served as the base for the Jund of the Jordan starting in 741 and in 756, it was the place in whose *muṣallā* (prayer space) was proclaimed emir ‘Abd al-Raḥmān b. Mu’āwiya (Martínez, 2003, 343). After Umar ibn Hafsun’s rebellion against the Emirate of Cordoba, the centre lost its relevance in the region’s political landscape as others rose in prominence. During the Nasrid period, Archidona would once again become relatively important with its status as a frontier town, consisting of a walled urban area and a citadel. Following the capture of Antequera by Castilian forces in 1410, it assumed a fundamental strategic role enabling access to the Vega de Granada, and serving as the first line of defence prior to neighbouring Loja.

The urban wall of the Cerro de la Virgen de Gracia is a prominent element in the landscape of Archidona, with a length of 450m and in a good state of preservation (Cumpián Rodríguez *et al.* 2012). Fourteen towers are preserved along its length, and except for one with a quadrangular plan, the rest have curved frontages. However, there are differences between the towers on the southern front, regular and prominent, compared to the more discreet and unequal ones on the eastern perimeter. Two entrances are recognisable in the wall, consisting of the Puerta del Sol at the eastern end of the enclosed area and the Puerta de la Ciudad in the south-western part (Fig. 3.38).



Fig. 3.37. The castle of Antequera (Ingo Mehling, Wikimedia Commons)





Fig. 3.38. The castle of Archidona (© Diputación de Málaga)

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# The cultural landscapes of medieval Iberian frontiers

*Guillermo García-Contreras and Luca Mattei*

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## Introduction

The concept of *cultural landscape* has emerged as a powerful analytical tool for understanding the spatial imprint of human societies across time. In the context of medieval Iberian frontiers, cultural landscapes offer a means to explore how social, political, economic and environmental transformations were materially embedded in territory. Far from being a neutral backdrop, the landscape was shaped, contested and reorganised by successive waves of conquest, colonisation and resettlement. It reflects the dynamic negotiation between inherited forms and new impositions, between continuity and rupture, and between competing logics of territorial control.

This chapter approaches the cultural landscapes of the Iberian frontiers not simply as ecological or geographical settings, but as historically contingent configurations of power, settlement and resource management. The shifting distribution and hierarchy of settlements – ranging from fortified hilltop villages (*hūsūn*) and isolated rural towers (*burj*) to nucleated Christian towns or seigneurial centres, whether under civil authority or religious institutions such as episcopal lordships – reveal the layered processes of adaptation and appropriation that marked the frontier zone. These patterns are not static; rather, they evolved in response to broader socio-political reconfigurations, including the implementation of *fueros*, the expansion of feudal lordships and the regulation of irrigation and land use systems.

To unravel these complex dynamics, this chapter employs a multiscale perspective. At the micro-level, the spatial organisation of individual sites – castles, villages, irrigated fields – provides insights into local practices of subsistence, defence and governance (see Chapters 2 and 5). At the meso-level, the structure of *alfoces*, rural districts centred on urban or semi-urban nuclei, illustrates the mechanisms of territorial consolidation and administrative control. At the macro-level, the juxtaposition of regional trajectories – such as those observed in Atienza, Sigüenza or Molina de Aragón in Guadalajara or the regions around Moclin in

Granada – enables us to compare models of transformation across different ecological and political contexts.

By combining archaeological evidence, historical documentation, and palaeoenvironmental data – although several of these matters will be further developed in this volume – this chapter argues that the cultural landscapes of the medieval Iberian frontiers are not merely the residue of past activity, but active expressions of social organisation and identity. Understanding these landscapes requires us to think across scales and disciplines, integrating the material and the symbolic, the spatial and the temporal.

## From Andalusi to feudal Christian landscapes: Continuities and transformations

The transition from Andalusi to feudal Christian landscapes in the Iberian frontier was neither uniform nor unidirectional. Rather than a clear-cut rupture, it involved a complex interplay between material continuities and profound political, legal and spatial reconfigurations. Archaeological and documentary evidence from multiple regions suggests that while many physical elements of the pre-conquest landscape – such as irrigation systems, road networks, rural settlements and even some fortified structures – remained in use, their meanings, functions and social embeddedness were often radically altered under Christian rule.

In the region of Guadalajara, especially in areas under our own study such as Sigüenza, Molina de Aragón and Atienza, the transformation of the landscape was deeply intertwined with the imposition of new feudal structures of power (García-Contreras Ruiz 2018). The appropriation and adaptation of existing Andalusi settlement patterns – including rural *alquerías*, towers, castles (*hūsūn*) and agricultural infrastructures – served as the foundation upon which new territorial entities were imposed. These included *Comunidades de Villa y Tierra*, episcopal lordships such as Sigüenza, and private seigneuries like that of the Lara lineage in Molina. While the material base persisted, the social

order was redefined: Andalusi rural sites were incorporated into Christian systems of governance, often marked by the imposition of *fueros* that established legal frameworks for colonisation, land tenure and resource control.

Similar dynamics can be observed in Granada and Málaga, where the Christian conquest brought about a radical reshaping of landscape governance. In the Vega of Granada, for example, the integration of a sophisticated Andalusi irrigation system into a late-feudal (or pre-modern) agrarian regime illustrates how environmental continuities masked deeper social ruptures (Esquilache and García-Contreras 2024). In Málaga, post-conquest transformations involved the reorganisation of settlement hierarchies and the redistribution of land to Christian settlers under new legal codes, while the existing hydraulic systems remained relatively stable – with only limited expansions – and profound changes did not begin until the expulsion of the moriscos in the late 17th century (Retamero and Martínez-Enamorado 2018). Yet, in both cases, the cultural memory and technical legacy of the Andalusi period remained materially embedded in the landscape.

Elsewhere, in eastern Iberia, comparable patterns emerged. In Valencia and Murcia, the Christian conquests of the 13th century did not result in wholesale destruction of Andalusi landscapes. Rather, legal and institutional changes – such as the distribution of land through *repartimientos*, or the restructuring of irrigated zones under Christian *concejos* – reframed existing territorial systems within new frameworks of control. A recent synthesis by Enric Guinot Rodríguez (2024) has shown how many rural settlements retained their physical layouts, and how hydraulic infrastructures continued to be used, although now managed by new lords, councils or ecclesiastical institutions.

During the 12th century, the role of *fueros* as well as the codification in written form of new proprietors, revised rural and urban regulations, and newly imposed fiscal duties were central in these processes. As legal instruments issued by monarchs or lords, these newly produced bodies of written documentation, particularly the *fueros*, not only regulated property rights and communal obligations, but also functioned as tools of territorial engineering. In Guadalajara, the *Fuero de Sigüenza* – modelled after that of Medinaceli – helped define a new feudal jurisdiction over a formerly Andalusi space (García-Contreras Ruiz 2025). Similarly, the *Fuero de Molina* regulated access to water and land in ways that reflect both continuity with prior use and the assertion of new forms of control by the Christian elite (Cabañas González 2013).

### Disarticulation of the urban Andalusi landscape

The conquest of Sigüenza offers a paradigmatic case of urban disarticulation and reconfiguration in medieval Iberia (García-Contreras Ruiz 2014, 2025). Contrary to narratives

of abrupt rupture, Sigüenza's transformation was gradual but profound: a landscape once marked by scattered rural hamlets and Andalusi fortifications was deliberately reshaped into an episcopal stronghold. Archaeological and documentary evidence emphasises that Sigüenza lacked significant urban continuity from its Islamic period, functioning instead as a loosely organised rural territory. Only following its capture in the 1120s did the episcopal establishment of Bishop Bernardo de Agen initiate a deliberate urbanisation process – erecting cathedral precincts, an episcopal palace, defensive walls and reorganised street networks – thus materialising a new Christian urban centre where no pre-conquest city formally existed.

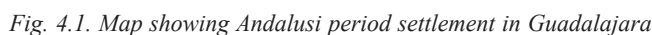
Beyond Sigüenza, similar processes unfolded elsewhere. In Murcia, the relocations of Muslim neighbourhoods to suburbs like Arrixaca after the conquest highlight both continuity in population and rupture in urban form: defensive walls, mosques and original street patterns were repurposed or erased, while Christian parishes and magistracies were imposed as instruments of spatial control and identity transformation (Eiroa Rodríguez *et al.* 2021). In Granada, the post-1492 transformation of the Albaicín demonstrates another model of disarticulation: this former Islamic quarter was reshaped through the conversion of mosques, the establishment of churches, the redefinition of water infrastructure and the imposition of administrative partitions – effectively overlaying a Christian civic structure onto an older Andalusi urban fabric, while erasing some pre-existing enclaves and fortifications.

Even in Seville, the Alcázar provides a compelling case: its Almohad-period alcazar and mosque were not merely repurposed but selectively demolished and rebuilt, signifying a shift from the Andalusi court to Castilian royal power. Muslim architectural legacies were reinterpreted through Mudejar forms, integrating elements of the past while structurally altering their spatial significance and meaning in the Christian city hierarchy.

These cases collectively highlight the duality of urban disarticulation: while physical elements of Andalusi urbanism – walls, cisterns, narrow lanes – persisted, they were systematically re-gridded, repurposed and imbued with new legal, ecclesiastical or royal functions. The result was a spatial reprogramming: Sigüenza's emergence as an episcopal centre, Murcia's suburban segregation, Granada's religious overlay and Seville's courtly adaptation all reflect the same trajectory – a sociopolitical remapping of space that erased or redefined Islamic urban presence while preserving fragments as instruments of Christian statecraft.

### Feudal power and the control of the new frontier territory

The Christian conquest of the Iberian frontier was not only a military process, but a deep spatial and institutional



In the northern and eastern part of Guadalajara, the transformation of the settlement pattern is clearly visible. Prior to the Christian conquest, the region had been part of the *Marca Media* of al-Andalus, structured through a network of *alquerías*, in some cases featuring peasant towers, hilltop *hūsūn* and watchtowers facing to the northern Christian area that supported a mixed agricultural and pastoral economy under Berber clans and local governors (García-Contreras Ruiz 2023) (Fig. 4.1). The articulation of small-scale territorial control units appears to become particularly visible during the 11th century, the period of the *fitna* following the

collapse of the Umayyad Caliphate, just before the Castilian conquest. After the conquests (c. mid-12th century), these elements were not immediately destroyed but repurposed and reterritorialised (Fig. 4.2). Towers that once served as rural observation points and storage sites for peasant production either disappeared as their original functions became obsolete, or were transformed into nodes of seigneurial control. In many cases, they underwent architectural expansion and adaptation, mirroring the development of newly consolidated centres of power – such as the site of Chilluentes, which was under the jurisdiction of Molina de Aragón and controlled by the Lara family. In other cases, new towers emerged that can be interpreted as *torres de presión*, intended to facilitate the colonisation of newly acquired agricultural lands by populations arriving in the wake of the conquests. Similarly, some Andalusí hilltop enclosures evolved into fortified Christian villages or small towns under episcopal or noble authority. However, most of these sites were either abandoned or saw their inhabited areas reduced to more fortified and ennobled military enclosures, while peasant populations settled in villages located on mid-slopes or in the flat areas at the base of the hills.



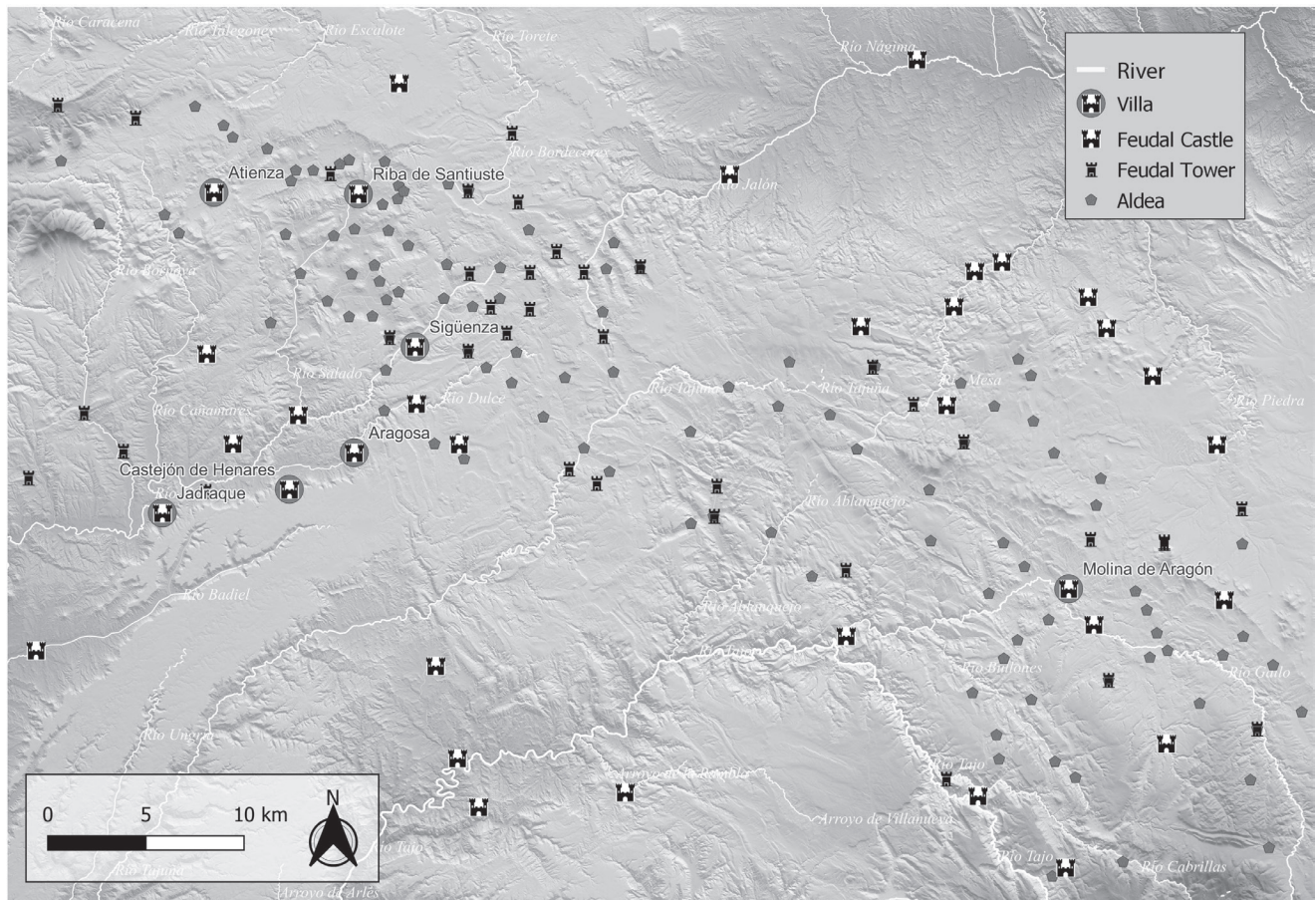


Fig. 4.2. Map showing settlement in Guadalajara after the Christian conquests

As has been explained before, in Sigüenza, for instance, the establishment of an episcopal lordship transformed a dispersed rural landscape into a hierarchised feudal territory centred on a newly built cathedral and a fortified episcopal castle. Yet, the majority of these settlements were either abandoned or transformed into compact, fortified and ennobled military strongholds, as rural communities relocated to new villages established along the mid-slopes or in the flatter foothill zones. Cases such as the castles of Riba de Santiuste, Torresaviñán or Galve de Sorbe serve as clear examples of this.

The *fuero* – a charter granted by the king or a lord – was a crucial tool in this process. It legally structured the resettlement and reorganisation of space, defining obligations, privileges, and territorial boundaries. The *Fuero de Sigüenza*, modelled on that of Medinaceli, granted rights to settlers while establishing the bishop's jurisdiction over a vast rural territory. Similarly, the *Fuero de Molina* not only regulated political and legal matters, but provided detailed instructions for irrigation management, communal farming, and territorial boundaries (Cabañas González 2013).

Further east, similar legal mechanisms operated. In Tortosa, the conquest by Ramon Berenguer IV in 1148 was followed by the elaboration of the *Carta de Población* and local *fueros* that reorganised the former Islamic medina and its territory into a Christian town and hinterland, assigning lands and rights to Catalan settlers while incorporating remaining Muslim populations under different legal conditions (Virgili Colet 2020). This process mirrors the widespread Christian practice of combining military conquest with juridical and administrative restructuring in order to establish durable frontier societies.

If we look further south – towards the Valencian region in the Crown of Aragón, and Andalusia within the Crown of Castile – from the 13th to 16th centuries, the *Libros de Repartimiento* became the primary expression of this Christian vision of landscape and its spatial codification. These texts recorded the distribution of land, buildings and irrigation rights among settlers following major conquests. In Valencia, the *Repartiment* of 1238 delineated new property boundaries over previously Muslim lands, parcelling out estates, orchards and urban lots to Christian knights, clergy and colonists (Guinot and Torró 2007). The



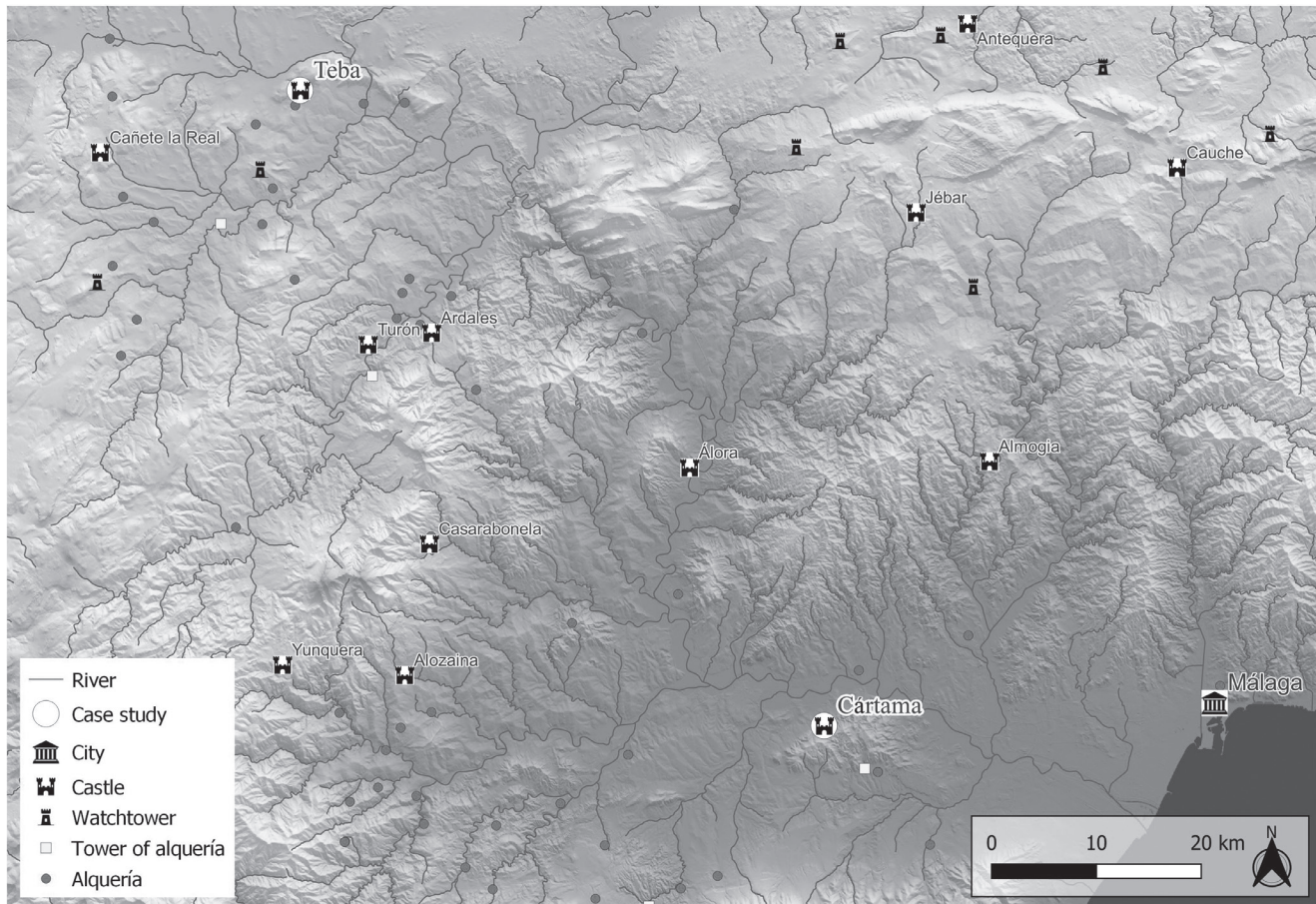


Fig. 4.3. Map showing Andalusí settlement in the Málaga region

process was equally thorough in the kingdom of Granada, where conquered territories were dissected, catalogued and distributed according to feudal hierarchies, privileging the needs of the new Christian elite while relegating or displacing Muslim communities (Malpica Cuello 2004). In these southern regions of the peninsula, however, what stands out is the particular emphasis placed on larger settlements – cities and fortified proto-urban centres that were so-called *villas* – which, in part as a legacy of the Andalusí urban system, became key nodes in the organisation of Christian settlement and the articulation of both civil and ecclesiastical power after the conquest (Plates 4.1 and 4.2). Examples such as Teba and Antequera in the province of Málaga (Figs 4.3 and 4.4), or Moclin and Íllora on the Granada frontier, clearly illustrate the strategic and administrative role played by these urban or semi-urban centres in the post-conquest landscape.

This systematic reterritorialisation also brought about a profound change in rural settlement patterns. The former Andalusí landscape of scattered *alquerías*, often situated near water sources and organised around collective management of irrigation, gave way to new Christian *aldeas*, often

nucleated and associated with castles, churches or defensive towers. These *aldeas* served as instruments of population control, tax collection and resource concentration. Archaeological and paleoenvironmental data suggest that many of these new villages were strategically located near fertile valleys, pastures or salt sources, highlighting the role of natural resource exploitation in shaping frontier settlement. For example, in the valleys around Sigüenza and Atienza, Christian *aldeas* were often placed to maximise access to cereal lands or to control transhumant routes and salt production areas (García-Contreras Ruiz 2018) (Figs 4.5 and 4.6). This concentration of settlements following the Castilian conquests produced an agrarian landscape characterised by extensive cultivated fields dotted with larger villages and smaller *cortijos*, which replaced the earlier proliferation of medium-sized *alquerías* typical of the pre-frontier period, simultaneously generating wide areas now devoid of habitation, as documented in the hills north of Granada (García Porras *et al.* 2019).

This restructuring was not merely pragmatic; it was ideological. The creation of new feudal units – *concejos*, *señoríos*, military orders – implied a complete



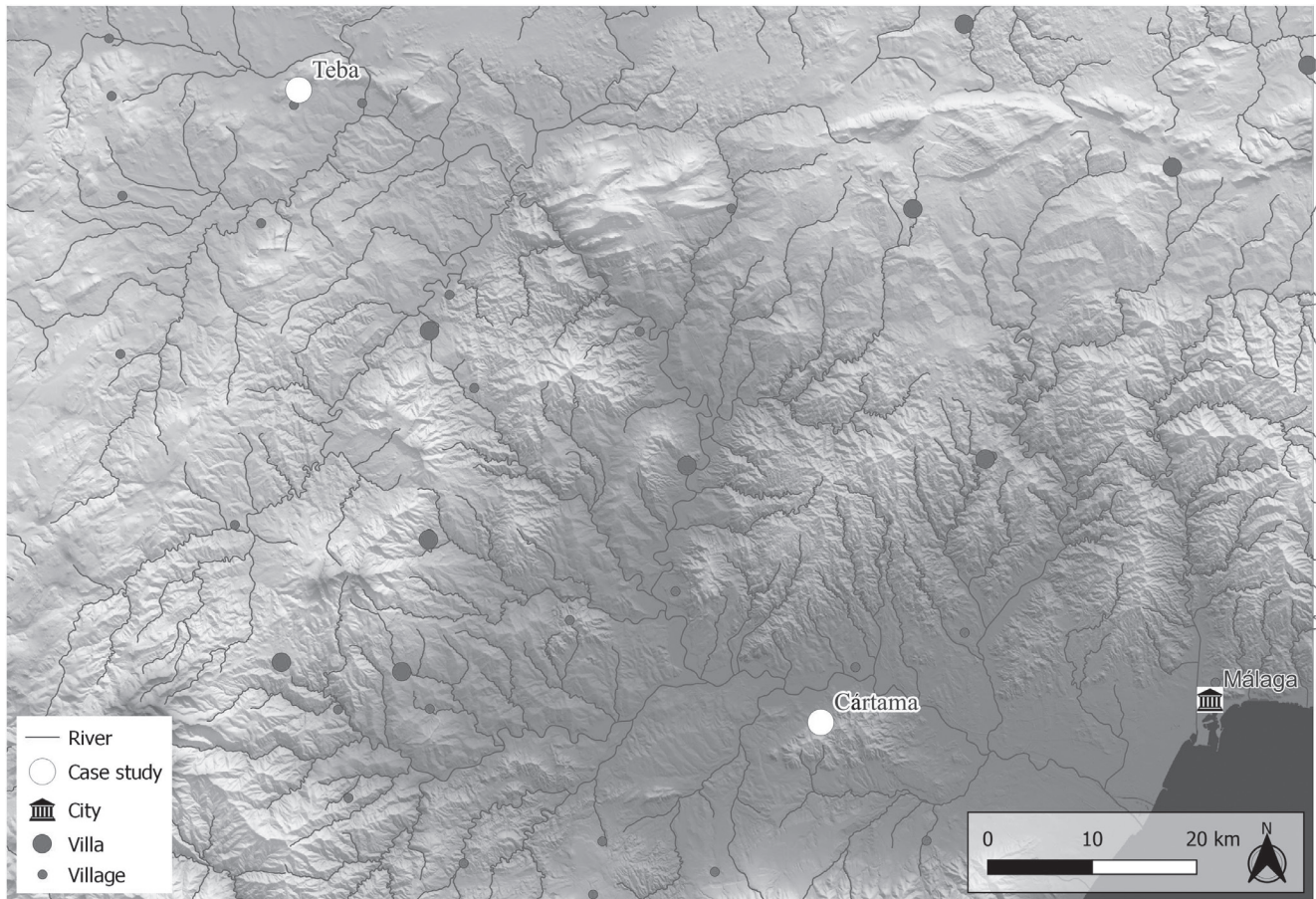


Fig. 4.4. Map showing settlement in the Málaga region after the Castilian conquest

reimagination of space. What had been a complex, poly-ethnic and multi-confessional landscape under Islamic rule was redefined according to the norms of Latin Christian governance, where law, lordship and landscape converged.

In sum, the Christian feudalisation of the frontier was as much about the codification and control of space as it was about conquest itself. Castles and towers marked visual and symbolic authority; *aldeas* and *concejos* organised productive labour and fiscal control; *fueros* and *Libros de Repartimiento* inscribed this new order into the land. The resulting landscapes were not neutral; they were deeply political expressions of a frontier society built on appropriation, regulation and transformation.

### Material culture and ethnicity

One of the most persistent challenges in the archaeology of medieval Iberia lies in identifying the religious or ethnic identity of social groups based solely on material remains. Unlike epigraphic or textual sources, material culture does not always carry clear, unambiguous markers of group affiliation. Everyday items – ceramics, tools, architecture,

food remains – often reflect shared regional or functional practices rather than distinct ethno-religious boundaries. This ambiguity is particularly acute in frontier contexts, where hybridisation, continuity (Thomas *et al.* 2017) and reuse blur the lines between ‘Christian’, ‘Muslim’ and ‘Jewish’ material signatures.

This interpretive problem is especially apparent in early post-conquest contexts, where continuity in pottery styles, domestic architecture and agrarian technologies often co-existed with new patterns of social and political control. For instance, in the valleys of Sigüenza and Molina de Aragón, many rural settlements retained Andalusí features well into the Christian period: rammed-earth architecture, subterranean silos and even aspects of irrigation infrastructure persisted, complicating efforts to distinguish between population continuity and cultural adaptation.

However, as Christian society became more socially and culturally homogenised – particularly from the 13th century onward – the visibility of religious minorities increased, both through legal segregation and through distinctive material practices. Jewish or Mudejar communities, while often integrated within urban centres, began to display specific



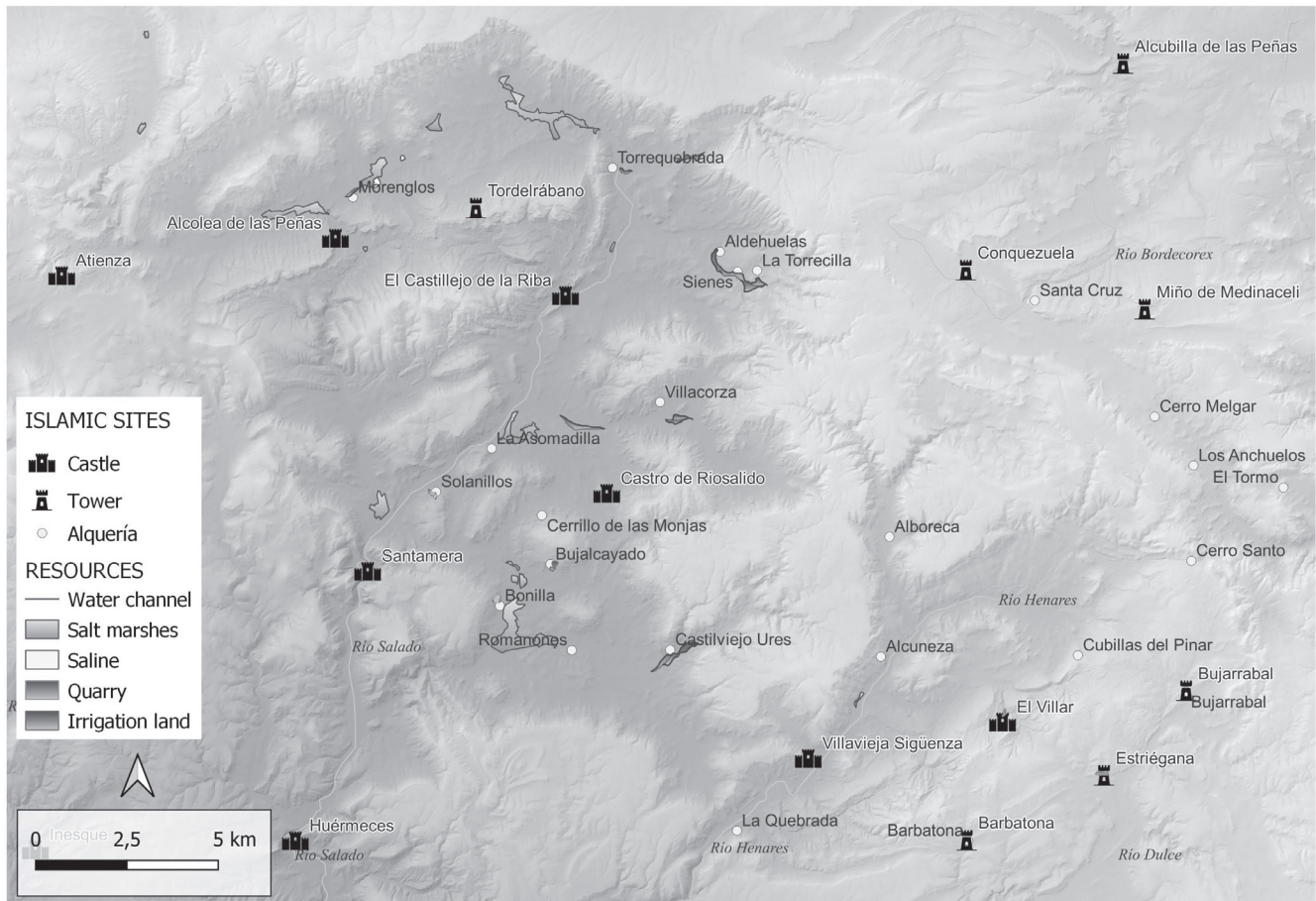


Fig. 4.5. Map showing the region around Atienza with settlement, hydrology and natural resources in the Andalusí period

residential patterns (such as *aljamas*, see Torró 2009) and certain dietary habits (e.g. strict avoidance of pork or shellfish or specific butchery practices identified through cut-mark analysis), that left archaeozoological traces in rubbish deposits (for example in Lorca, Murcia, according to García-García *et al.* 2024). Mudejares, Muslims living under Christian rule, similarly left archaeological footprints, especially in rural areas where they continued to produce ceramics using Islamic techniques, maintained distinct funerary traditions and preserved certain architectural forms such as the use of brickwork or horseshoe arches in domestic buildings.

A striking case comes from Granada and its surrounding territory after the 1492 conquest, where morisco populations – Muslims forcibly converted to Christianity – remained materially distinctive until their eventual expulsion in the early 17th century (García-García *et al.* 2021). Archaeological surveys around former morisco villages in parts of Málaga province reveal differences in the spatial arrangements when compared with neighbouring Old Christian settlements. Most notably, stark inequalities emerged in the ways land was accessed and

agricultural spaces were organised and controlled (López and Retamero 2017). These differences, while subtle, underscore the resilience of minority identities and the continued negotiation of cultural boundaries within a dominant feudal-Christian order.

Moreover, the material culture of minority groups became more legible not because they changed, but because the dominant Christian society imposed increasing constraints on their spatial, economic and cultural lives. As Christian norms and aesthetics took hold – particularly in public architecture, urban planning and production systems – minority practices stood out more clearly. Ironically, then, it is the success of Christian homogenisation that renders minority material culture more archaeologically visible.

Understanding ethnicity through material culture in frontier Iberia thus requires a cautious and context-sensitive approach. It is not merely a matter of detecting ‘Muslim’ or ‘Jewish’ artefacts, but of tracing the social, political and legal frameworks that rendered certain groups visible – or invisible – in the archaeological record. It is important to acknowledge that the newly configured frontier landscapes resulting from feudal conquests were not solely

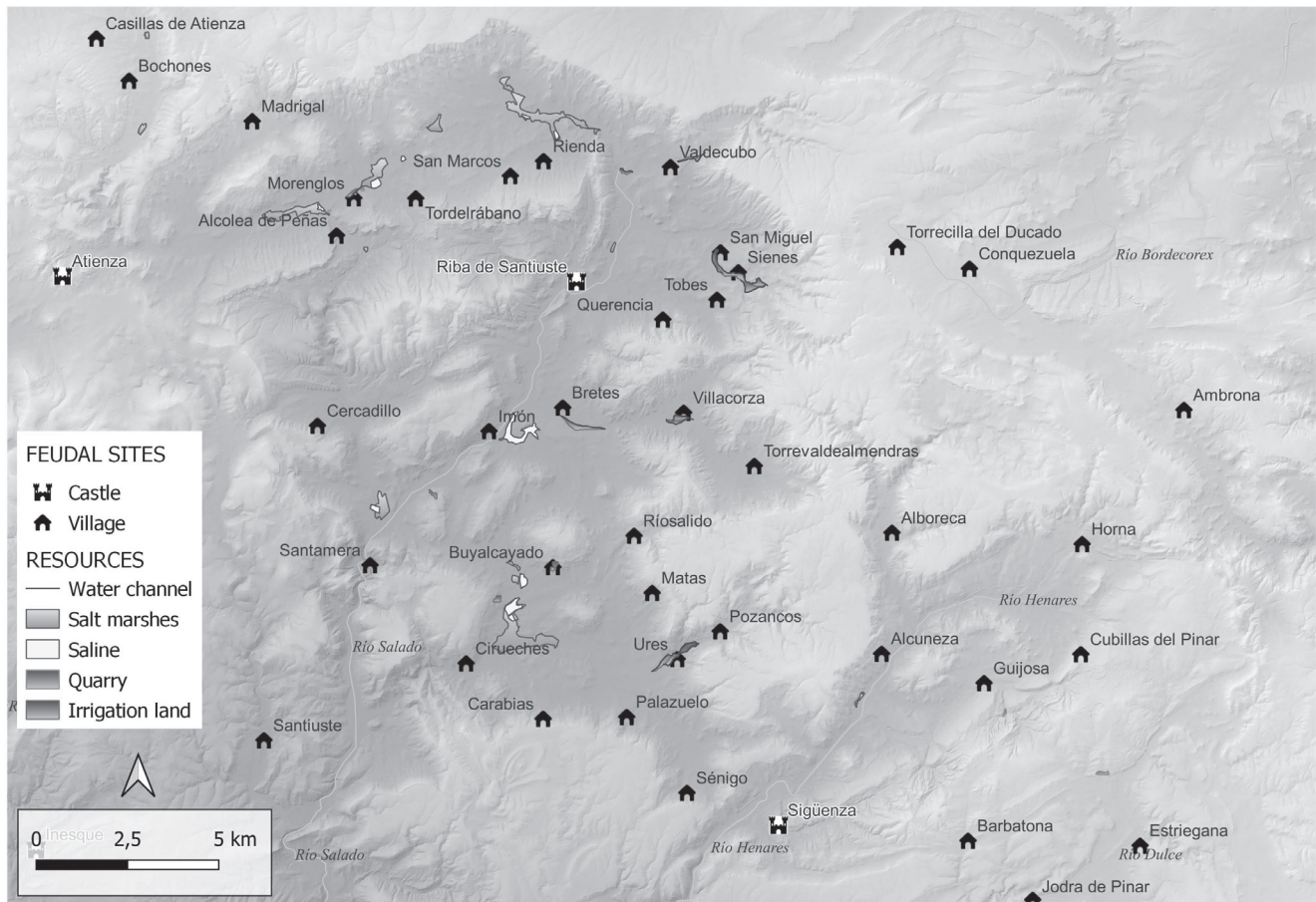


Fig. 4.6. Map showing the region around Atienza with settlement, hydrology and natural resources after the Castilian conquest

Christian in character. They were also inhabited by multiple ethno-religious groups, whose continued presence and, in some instances, active agency must be factored into any comprehensive interpretation of post-conquest spatial and social dynamics.

### Environmental and ecological transformations in the feudalised landscape

As is evidenced throughout different chapters of this volume, the transformation of the Iberian frontier during the high and late Middle Ages cannot be fully understood without considering the environmental and ecological consequences of feudalisation. While military conquest and frontier dynamics certainly played a role in reshaping landscapes – particularly through the construction of castles, concentrated villages, roads and defensive settlements – the most sustained and impactful transformations stemmed from the interplay between peasant agency, feudal fiscal regimes and broader ecological pressures. It is at this intersection that cultural landscapes emerge not as the product of elite imposition alone, but as the result of

negotiated practices of land use, settlement and resource management (see also Chapter 5).

In the territories of Sigüenza, Molina de Aragón and Atienza, for example, the 11th- to 13th-century shift from Andalusi to Christian rule entailed significant changes in land tenure, access to natural resources and settlement organisation (García-Contreras Ruiz 2018; Ortega Ortega and Arenas Esteban 2018). These changes were often framed by fiscal instruments – *fueros*, seigneurial rents and ecclesiastical tithes – that redefined the obligations of rural communities. Such impositions had a direct impact on the types of crops cultivated, the locations of settlements and the organisation of agricultural and pastoral cycles. The push toward cereal agriculture in valleys previously dedicated to mixed farming or orchard systems illustrates the alignment of peasant production with feudal demands for taxable surplus.

Alongside the expansion of cereal cultivation, extensive livestock herding emerged as a central pillar of the post-conquest rural economy – evident in practices such as the establishment of grazing commons, regulated meadow access and the delineation of pastoral territories tied to individual



lordships – or shared among neighbouring villages. Seasonal livestock movement, both local (*transtermitance*) and long-distance transhumance (eventually institutionalised under the *Mesta*), further exemplified the importance of livestock in shaping frontier landscapes and economic strategies. Evidence from medieval Spain indicates that transhumance was not merely a pastoral practice, but a powerful agent of environmental transformation. It contributed to landscape deforestation, especially in upland zones, as flocks were moved to graze in subalpine and mountain pastures – thereby preserving grasslands but reducing forest cover. At the same time, pastoralism gained new prominence, not only as a strategy of frontier mobility, but as a response to both environmental conditions and feudal structures. The presence of open plateaus, mountain pastures and transhumant corridors – especially in the uplands of Guadalajara and adjacent areas – favoured the development of sheep and goat herding systems that were deeply embedded in the fiscal and legal structures of local *concejos* or noble jurisdictions. In places like the Gallo river valley near Molina, local *fueros* regulated the use of irrigation systems and grazing lands, often in ways that reflected a tension between elite control and community management.

Recent archaeozoological and geoarchaeological research confirms that sheep and goat mobility intensified after the 11th century. Studies in eastern al-Andalus have revealed early evidence of sheep breeding for wool, pre-dating the peak of Castilian transhumance, and pushing livestock into greater altitudinal ranges (Jiménez-Castillo *et al.* 2025). Cross-disciplinary analyses conducted in Pyrenean environments show that seasonal mobility contributed to both biodiversity maintenance in meadows and soil compaction in high country grazing areas (García-Ruiz *et al.* 2020) (see also Chapters 7 and 14).

Key pastoral infrastructure – *dehesas* (wood pastures), *cañadas reales* (official drovers' roads) – and the protections extended by the *Mesta* ensured that these practices were not only economically important but socially institutionalised and politically protected. The continuous movement of thousands of sheep along these routes created enduring ecological effects, including suppression of tree regeneration and soil erosion in winter ranges, even as grasslands were maintained by grazing pressure.

This livestock-centred landscape was critically shaped by negotiations – urban councils, military orders, landlords and peasants all had stakes. Peasant communities, for example, managed *boalae* or *ovetarium* (enclosures for community-drawn animals) and local pasturelands through collective governance, exemplifying bottom-up agency in resource management (Pascua Echegaray 2011). Yet, as the power of nobility and the *Mesta* grew – especially in the 14th to 16th centuries – smaller herders were progressively marginalised, their access to high-quality pastures restricted. In frontier territories like Guadalajara, the combined

expansion of cereals and sheep herding repopulated valley floors – even marginal lands – while shepherding routes reinforced settlement nodes. The synergy of peasant mobility, lordly regulation, and institutional frameworks like the *Mesta* shaped not just economic opportunities, but also the physical and ecological contours of frontier landscapes from the 12th century onwards.

Crucially, these transformations were not the product of top-down imposition alone. Peasant agency – expressed through the founding of new hamlets, the reshaping of traditional cultivation spaces and the management of woodland and marginal lands – was central to the formation of feudal cultural landscapes. Archaeological surveys reveal patterns of small-scale terracing, intensive cultivation of marginal soils and adaptive uses of microclimates that suggest considerable local knowledge and environmental expertise. Rather than passive subjects, peasants actively reshaped the landscape within the constraints and opportunities offered by new legal and political systems.

The selection of settlement sites was likewise affected by these overlapping dynamics. While some new *aldeas* were founded near castles or churches for reasons of security or jurisdictional clarity, many others reflect ecological considerations: access to water, defensibility, availability of arable or pasture land, and even protection from climatic extremes. The relocation or abandonment of certain *alquerías* and the rise of nucleated Christian hamlets thus reflect both strategic frontier planning and local environmental rationality.

In some cases, the exploitation of specific natural resources clearly illustrates these new dynamics. Salt production provides a compelling example: during the Andalusí period, saltworks were often under direct control of rural communities, which explains the proximity of many early rural settlements to solar evaporation ponds across various regions of the peninsula (García-Contreras Ruiz 2021). However, following the Christian conquests, salt production became a highly coveted resource, increasingly appropriated by the new dominant powers. So intense was the competition over salt that it triggered disputes among the monarchy, noble families, ecclesiastical institutions (including episcopal sees, monasteries and religious orders) and other agents – such as Jewish merchants – who were granted privileges over its extraction and trade. As a consequence, the productive infrastructure of inland saltworks expanded, growing beyond their earlier, more modest scale. Moreover, as salt extraction was progressively managed as a seasonal labour system, carried out by 'salt workers' (*hombres de la sal*) contracted by those institutions, the peasant settlements gradually relocated away from the salt pans. This spatial shift reflected a broader reorganisation of the rural landscape: no longer prioritising multifunctional resource exploitation (i.e. combining salt, agriculture, livestock and forest use), the new system imposed highly specialised and

fiscally regulated modes of production. Salt, no longer in the hands of local communities, became a strategic commodity controlled by elites, prompting peasants to settle in alternative ecological niches, distant from saline basins (García-Contreras Ruiz 2019).

Despite these insights, a crucial dimension remains underexplored: the interplay between socio-political transformations and climatic variability – especially at the moment of the feudal Christian conquest and the creation of new frontier borders. Paleoenvironmental evidence indicates that the shift toward feudal agriculture and water management occurred during the Medieval Climate Anomaly (MCA, c. AD 900–1300), a notably warm and arid phase in Mediterranean Iberia. Sediment records show decreased lake levels, increased xerophytic vegetation and stronger Saharan dust fluxes during this period (Moreno *et al.* 2012). These arid conditions likely compelled both Andalusi and subsequent Christian farmers to invest heavily in irrigation technologies – such as *acequias*, *norias* and wells – to secure crop yields and adapt to the demands of growing urban and rural populations. Simultaneously, in more Atlantic-influenced regions – under the authority of expanding feudal monarchies – hydrological variability linked to fluctuations in the North Atlantic Oscillation (NAO) produced more erratic moisture patterns, as shown in multiproxy studies using Central Iberian lake sediments (Sánchez-López *et al.* 2016). Furthermore, these climatic conditions coincided with the onset of the Little Ice Age in the 14th century, which brought cooler, wetter climates across Iberia. This cooling trend placed additional pressure on frontier communities to maintain agricultural resilience through hydraulic and territorial reorganisation. As Pluskowski *et al.* (2011) assert, understanding the environmental consequences of conquest is essential for grasping long-term frontier sustainability. Consequently, climate acted both as a catalyst and a constraint: the MCA's aridity incentivised agri-hydraulic innovation, while the Little Ice Age's increasing rainfall and cooling demanded adaptability in crop and settlement strategies. These climatic shifts intersected with the feudal imposition of *fueros*, *Libros de Repartimiento* and frontier colonisation policies, producing a newly codified, climate-aware rural landscape. This integrated climate-social lens is now widely understood as critical for explaining how and why Andalusi irrigation systems were adopted, how new crops became common, how settlement hierarchies solidified and why certain regions pursued differing strategies based on ecological context.

In sum, the ecological reshaping of the Iberian frontier cannot be reduced to the consequences of military conquest or elite planning. Instead, it reflects a multilayered process in which peasant strategies, fiscal frameworks, territorial reorganisation and environmental constraints interacted over time to produce the cultural landscapes we now seek

to reconstruct. These landscapes, simultaneously natural and social, material and ideological, are the clearest testimony to the complex entanglements of power, subsistence, and environment in medieval frontier societies.

### Symbolic and religious uses of the landscape

Beyond their economic and administrative functions, the landscapes of the Iberian frontier were also deeply symbolic and ritually charged spaces, shaped by the spiritual imperatives and ideological frameworks of both Christian and Islamic societies. As conquest and colonisation advanced, the new Christian rulers undertook not only the reorganisation of land and production, but also the sacralisation of space through architecture, ritual infrastructure and symbolic redefinition of the inherited landscape. These acts of spatial sacralisation served to legitimate Christian authority, embed religious institutions into everyday life, and overwrite – or appropriate – the memory of al-Andalus.

In the central Iberian plateau, particularly in the territories of Guadalajara, the construction of Romanesque churches played a pivotal symbolic role. Located at the centre of newly established Christian *aldeas* or in strategic elevated positions, these churches – with their distinctive apse orientation, sculptural programmes and, especially, their bell towers – functioned not only as places of worship but as visual beacons of Christian domination. The campanile, often the tallest structure in the landscape, audibly marked liturgical time and publicly asserted the presence of Latin Christianity across former Andalusi territories. In villages like Albendiego or Carabias, small Romanesque churches signal the projection of ecclesiastical authority and the embedding of Christian sacred geographies into the rural environment.

In Granada, the case of Moclin exemplifies the symbolic transformation of fortified landscapes (García Porras 2014, 2020). Initially a Nasrid military settlement, Moclin underwent a profound spatial and symbolic reconfiguration after its conquest in 1486. The reduction of its habitat – from a densely inhabited hilltop *hışn* to a sparsely populated Christian military outpost – was accompanied by the conversion of Islamic defensive structures into Christian castles, including the construction of a tower of homage that signified the definitive appropriation of the space by Christian military elites. This monumental tower, more than a defensive element, functioned as a symbol of new sovereignty, visibly dominating the surrounding valleys and inscribing a new meaning onto a landscape that had previously been Islamic in both form and function.

Another example of symbolic imposition comes from the *Fuero de Molina*, which not only regulated land and water rights (García-Contreras Ruiz *et al.* 2023) but also mandated the construction and maintenance of churches, ensuring that Christian religiosity was materially and spatially inscribed



into every corner of the landscape. Similarly, in Atienza, the proliferation of parish churches – each serving specific barrios or rural districts – demonstrates the fragmentary but persistent Christianisation of space through a network of sacred sites, many of them built near or upon older settlements with pre-Christian or Islamic origins.

However, the Christianisation of these landscapes did not occur in a one-sided or homogeneous way – mirroring similar patterns observed across medieval Europe (Thomas *et al.* 2017). In the 11th–12th centuries visible efforts to integrate conquered Muslim communities have been linked to the use of bilingual inscriptions in Arabic and Latin, such as on the Romanesque arch of the parish church in Atienza. In many contexts, particularly in the 13th and 14th centuries, Jewish and Mudéjar communities continued to inhabit and ritualise spaces, albeit within increasingly circumscribed boundaries. The presence of synagogues or Muslim cemeteries, often located outside city walls or in marginal spaces, reflects a symbolic geography of exclusion, even as it testifies to the ongoing multi-religious character of the frontier landscape. In Murcia, for example, the Arrixaca quarter became the main Mudéjar space of the city, preserving certain cultural and ritual practices even under Christian sovereignty.

Thus, the symbolic landscape of the frontier was not simply about replacing one religion with another, but about layering meanings, reconfiguring spatial hierarchies and embedding power through built form. Churches, castles, cemeteries, towers and even roads became part of a ritual cartography that sought to control not just the land, but also the memory and identity of its inhabitants.

## Conclusion

The study of medieval Iberian frontier landscapes reveals not only the spatial consequences of conquest and colonisation, but also the intricate ways in which power, identity and everyday life were materialised across scales. From the micro-level of settlement organisation and productive infrastructure to the macro-level of regional systems and transfrontier dynamics, the cultural (re)conquered landscape emerges as a palimpsest of political ambitions, economic structures and social negotiations. These landscapes were not passive outcomes of military victories, but active arenas where communities, lords, institutions and environments interacted – conflicting, adapting and co-producing space over time.

Between the 12th and 16th centuries, the transformation from Andalusi to Christian feudal landscapes was shaped by a combination of conquest, colonisation and state formation. While the legal, institutional and symbolic orders of Christian society imposed new logics of territorial control – expressed in *fueros*, *concejos*, castles and repopulated villages – the material and ecological

foundations of the earlier Islamic period often persisted, reframed within emerging systems of feudal lordship and Christian governance. Over the long term, this process involved both rupture and adaptation, culminating in the consolidation of Christian monarchies, the persecution or expulsion of religious minorities, and the progressive integration of formerly frontier regions into centralised state structures.

The frontier condition played a central role throughout this period. It amplified the need for spatial control, symbolic assertion and resource consolidation, producing landscapes that were militarised, ritualised and strategically resettled. Yet, as this chapter has sought to demonstrate, it would be reductive to view these landscapes solely through the lens of elite power or military conquest. The agency of peasant communities, the enduring utility of inherited knowledge systems, and the adaptability of rural societies were equally decisive in shaping the form and function of frontier territories.

Moreover, the material record – ceramics, architecture, environmental data – paired with legal and administrative texts such as *fueros* and *Libros de Repartimiento*, allows us to trace how identities, jurisdictions and production regimes were spatialised across the peninsula. From the episcopal consolidation in Sigüenza to the Christian reinterpretation of irrigated and fortified landscapes in Granada and Málaga, and from the symbolic reoccupation of urban centres like Tortosa and Valencia to the persistent visibility of Mudéjar and morisco material cultures in rural areas, the Iberian frontier was a crucible of cultural and territorial redefinition.

In this sense, the landscapes of (re)conquest were not merely zones of transition – they were engines of historical transformation. They constituted the interface where Latin Christendom absorbed, transformed and reconfigured the legacy of al-Andalus, forging new social geographies whose traces endure in the terrain, the archive and the built environment. By examining these processes through an integrated, multiscale lens, this chapter underscores the analytical power of cultural landscape as a concept, and its indispensable role in understanding the complexity and diversity of Iberia's frontier worlds between the 12th and 16th centuries.

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## Land use in medieval Iberian frontier societies

*Rowena Banerjea, Luca Mattei, Alex Brown, Lionello Morandi and  
Phillip Toms*

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### Introduction

This chapter provides a comparative study of historical territories within the modern Spanish provinces of Guadalajara, Granada and Málaga, to evaluate diachronic land use with a particular focus on cultivation, pasture, forestry and quarrying. It examines the changing landscape through the adoption, extension or abandonment of Andalusí terraces and irrigation channels following the Christian conquests in the case study regions, integrating geoarchaeological and digital geoarchaeological approaches, such as GIS mapping. It draws on palynological studies, landscape archaeology, written and cartographic sources to investigate the impact of regime change on the organisation of economically productive land around the following case study sites (as detailed in Chapter 3) Atienza and Molina de Aragón (both Guadalajara), Cartuja, Agicampe (both Granada), and Cártama and Teba (both Málaga). Soil and sediment micromorphology has considerable potential to investigate agricultural soils to provide not only pedological but geomorphological information on the addition of soil to a terrace, its transformation, including amelioration and irrigation, weathering through bioturbation and tillage as well as soil erosion (Adderley *et al.* 2018; Brown *et al.* 2021).

It is well understood that human activity has played a central role in shaping the environment, particularly the modification of flora and physical landscapes due to past land management practices; modulated by varied, often interconnected, natural and anthropogenic factors including climate, topography, hydrology, soils and social, economic and political influences. Agriculture, together with industrial activities (e.g. mining) and the requirements for timber as a vital commodity in medieval society were important drivers of landscape evolution. The palaeoenvironmental record is evaluated and synthesised for central Spain and

Andalusia. It is not the intention here to provide a detailed overview of the vegetation history of these regions, but rather to highlight selected key studies and patterns of environmental change as evidence for broad patterns of medieval land use in conjunction with spatial analysis of settlement patterns for our case study areas and their geology maps, soil maps, current and documented historical land use.

To obtain the data from the land-use capacity maps, in the cases of Andalusia (Cartuja, Agicampe, Teba and Cártama), information available on the web and provided by the Andalusian Environmental Information Network (REDIAM) has been used. Based on the characteristics and analysis of the soils, four main groups have been classified: lands with excellent use capacity, lands with good or moderate use capacity, lands with moderate to marginal use capacity and marginal or unproductive lands. In case studies within the territory of Guadalajara, the Autonomous Community of Castilla La Mancha does not have this type of open data. To obtain this information, other types of land-use references have been reclassified, such as CORINE Land Cover (CLC), a project of the European Environment Agency that was born with the objective of obtaining a European occupation database of the soil updated to several reference years. From this information we have been able to reclassify through an equivalence table that represents the same four groups of distinction of capacity of use, as in the case of Andalusia. To obtain the data from the geological maps (Plates 5.1–6), we have relied on the National Geological Cartography, more specifically on the visualisation service (WMS) of the geological map which represents the result of the cartographic homogenisation of the MAGNA geological map series. These data are presented in order to examine land use of the case study areas in their geological context which



influences factors such as soil capacity and the selection of locations for settlement, agriculture and defence.

In the case studies of Agicampe and Cartuja (Plates 5.7, 5.8) we can see how the plains of the Granada basin provide large portions of excellent and fertile lands adapted to intensive irrigated cultivation, territory known respectively as the Vega of Granada and the Vega of Loja, both articulated on the fluvial axis of the Genil river. In the case studies of Cártama and Teba (Plates 5.9, 5.10) it is striking how, despite having two river courses such as the Guadalteba and the Guadalhorce, these do not generate lands of excellent capacity along their route. The opposite is the case, as the large amount of forest land generates extensive portions of marginal or unproductive land. Drawing on multiple sources of evidence enables the adoption of a multi-scalar approach to understanding historic land use.

As discussed by Banerjee *et al.* (2019), whilst there have been geoarchaeological investigations into the evolution of arid and semi-arid agriculture associated with medieval rural settlements in several areas in Spain, including Murcia (Puy and Balbo 2013; Puy 2014), Galicia (Ferro-Vázquez *et al.* 2014) and the Basque country (Quirós Castillo *et al.* 2014; Quirós Castillo and Nicolsia 2019), castles are rarely included within studies of the different agrarian landscapes in Iberia, despite being central points in the distribution of settlements. Our understanding of the patterns, timing and scale of landscape change in medieval Iberia are best informed using scientific data, which includes palaeoenvironmental analyses of microfossils (e.g. pollen) contained in lake sediments, peat bogs and archaeological features. Numerous such studies are available across Spain, most recently synthesised in the *Paleoflora y Paleovegetación Ibérica: Holoceno* (Carrión 2022), with relevant studies distributed across all landscape zones from mountain to fertile lowlands and coasts. The strengths and limitations of the use of these palynology studies in understanding landscape change and land use in medieval Iberia is assessed in this chapter, as well as how they are supported and strengthened by geoarchaeological analyses.

## Guadalajara

### *Upland land use*

Within central Spain, while numerous pollen sequences are available, these are largely located to the west and south-west of Atienza and Molina de Aragón within the Guadarrama mountain range of the Central System, and further to the south-west within the Montes de Toledo. Blanco-González *et al.* (2014) have undertaken an important synthesis of the pollen data from the Central System. The authors highlight the paucity of high-resolution palynological studies from this area, which vary in their temporal resolution, and in common with palynological studies

across the Iberian Peninsula tend to concentrate within later prehistoric rather than historic periods. Blanco-González *et al.* (2014) recognise two broad phases of land use during the medieval period, first involving localised land-use impacts to the north of the Central System from the 5th to 12th centuries, followed from the 12th century by colonisation of upland areas. The region saw impacts during the preceding Visigothic period (5th to early 8th century), with a reduction in oak woodlands in lowland settings and pine in upland environments, together with an expansion of cereals and evidence for pastoral activity. This pattern is visible in pollen sequences from Peña Negra mire (Abel-Schaad and López-Sáez 2013), Lanzahíta (López-Sáez *et al.* 2010) and Pelagallinas (Franco-Múgica *et al.* 2001).

The Islamic conquest and fall of the Visigothic Kingdom are marked by both evidence for continued anthropogenic activity in lowlands along with evidence for some forest recovery in high-altitude settings. Within upland frontier landscapes, settlement is likely to have been patchy and impacted by sporadic conflict between Christian and Islamic states. To the south with the Toledo Mountains, pollen from Bermu and other sequences indicate that the landscape was predominantly open in the Islamic period, with upland areas utilised for grazing pasture lands and lowlands for cereal cultivation (Luelmo-Lautenschlaeger *et al.* 2018).

There is an increase in evidence for land use from the 11th century, reflecting the southwards movement of the frontier following the conquest of Toledo in 1085, together with milder climatic conditions associated with the Late Medieval Warm Period; indicators of cereal cultivation along with the cultivation and management of olive and sweet chestnut.

Settlement intensification during the late medieval period (12th–13th centuries) is apparent in both upland and lowland landscapes, with increasing land use evidence in palynological sequences. Woodland clearance increases in mountainous areas used for seasonal pastoralism with cultivation of rye, olive and sweet chestnut apparent from lowland environments. Evidence for an increase in olive is apparent in the pollen sequence from Pelagallinas, c. 17km west of Atienza (Franco-Múgica *et al.* 2001). Pollen data from the region provide a longer-term perspective on land-use change. A pollen core from Somolinos – very near Atienza – indicates that the first very strong vegetation change occurred as early as the 2nd century BC. At that time, arboreal taxa (notably *Pinus*) dropped significantly, while herbaceous plants increased (Currás *et al.* 2012). This shift is accompanied by clear signs of grazing pressure in the area, evidenced by the presence of coprophilous fungal spores. Further vegetation changes, including a continued rise in herbaceous plants and an increase in *Quercus* (oak) pollen, occurred before Late Antiquity, during the Classical period. These findings suggest that human-induced landscape

transformation, including deforestation and pastoral activity, began centuries before the medieval period. Desiccation of the lake begins from the 4th century onwards and chronological resolution for the period between 8th–13th centuries AD is very low.

The Cañamares area (Currás Domínguez 2012) was characterised by a deforested landscape around the 5th century AD. The pollen record reflects the landscape transformation that occurred between the late Middle Ages and the early modern period. The development of livestock farming documented since the late 13th century AD had favoured a partially forested landscape in which some type of agroforestry system could be implemented. The low values of tree taxa indicate that this vegetation cover configuration remained stable and the tree layer did not undergo any regeneration process until the 12th century AD. From the 9th and 10th centuries AD, a greater influence of human activities has been detected, the effects of which are evident in the recovery of cultivated taxa and the development of ruderal taxa such as *Rumex acetosa*-t or open-environ taxa such as Asterioideae. An increase in *Olea* is also recorded, which could demonstrate the spread of olive groves at a regional level. The sequence reveals the presence of other indicators, sometimes linked to pasture areas in Mediterranean ecosystems. Crop indicators reveal stable land use during the 10th and 11th centuries AD.

Prospection in the territory of the castle of Molina de Aragón, as part of the Landscapes of (Re)Conquest project, did not identify any usable lacustrine sequences for palaeoenvironmental reconstruction of the castle's hinterland (Plate 5.11). The sequences that were recovered were all shallow (< 1m in depth), minerogenic, and had been subjected to frequent wetting and drying cycles evidenced by oxidised iron laminations throughout. While low counts of pollen were observed from a core at La Yunta, no plant macroremains were recovered for radiometric dating, and so pollen grains were extracted producing the following dates from the following depths, indicating some mixing of the peaty deposits within the sequence between the depths of 42–47cm: 8940 ± 30 BP at 42–43cm; 3320 ± 30 BP at 43–44cm; 5540 ± 30 BP at 45–46cm; 3480 ± 30 BP at 46–47cm. Given the shallow depth of the sediment in the lake and the prehistoric dates, it is hypothesised that these shallow lakes have a very slow sediment accumulation rate and experience regular wetting and drying cycles; consequently, they are unsuitable for palaeoenvironmental reconstruction.

### Cultivation

In the case studies of the province of Guadalajara we find a territory that presents more heterogeneous lands where there are some plots of land with excellent soil capacity. In the case of Molina de Aragón they are structured around the Gallo river (Plate 5.12), in the case of Atienza they

are generated near streams in the open land around the village (Plate 5.13). The data for the maps of irrigated terraces and dryland terraced plots have been obtained in a different way depending on each of the case studies. In the case of Molina de Aragón (Plate 5.14), we can see how there are irrigated terraces along the Gallo river, described and regulated from the Communal Charter of the town of Molina dating in 1152–1154, which have been analysed and interpreted in a recent work as Andalusi. It would be previously irrigated spaces that the new rulers inherited and regulated their operation, based on the needs and demands of the new society that was being formed (García-Contreras Ruiz *et al.* 2023). At the same time, another investigation was carried out to detect the crop terraces that were still exploited and visible in the photograph of the 1956–1957 American flight, and were immediately abandoned after (Flores Navarraz 2021). In 2015, excavation of the terrace system adjacent to the fortification revealed the following profile, base to surface (García-Contreras Ruiz *et al.* 2016): C horizon; buried soil; colluvium; and modern topsoil. A single fragment of medieval pottery was recovered in the make-up of the terrace wall, and an OSL sample produced an age estimate of AD 930–AD 1160 (Toms 2025) for the sediment at the base of the buried soil. The terrace soil may have received manuring up to the 20th century as attested by a fragment of ceramic produced between the 19th and 20th centuries. The colluvial sediment above did not contain any material culture.

In the case of Atienza (Plate 5.15), we can see how the irrigated areas associated with Andalusi pottery are small, and are found both along water courses and in some plots on terraces irrigated by springs. Some dry land terraces abandoned at the beginning of the second half of the last century are also documented.

In 2016, coring prospection and subsequent test trench excavation located an irrigated field system in Molina de Aragón and geoarchaeological samples were collected. A 1m × 1.5m trench was dug in an irrigated allotment area of the town, which was in use in 2016 by inhabitants of the town for growing vegetables. The ceramic chronology identified the earliest deposits as the establishment of a medieval field system beginning in the feudal period. The allotment area (coords) is near the river Gallo and visible from the castle (Plate 5.16). The trench was excavated to a depth of 1.5–2.0m below the surface, reaching alluvial sediment relating to over-bank flood deposits from the River Gallo. The calcareous natural riverbed alluvial sediment (SU 6007) is at the base of the profile, over which an additional alluvial deposit (SU 6006), containing 12th–13th century AD ceramics, was recorded at the current water table. The ceramics are abraded and rounded and considered to be a secondary deposit that has resulted from river action and sediment transport from a nearby location upstream. Stratigraphically above SU 6006 is SU 6004,

which was another heavily compacted and waterlogged stratum, and lies below the modern agricultural soils that contain plastic and modern glass fragments (SU 6001 and SU 6002). SU 6004 was considered to be an older agricultural soil containing 15th-century ceramics, and is cut by an old irrigation ditch (*acequia*), which was filled with a silty sediment (SU 6003).

Four micromorphology samples, from which a total of six thin sections were prepared, were analysed to aid the identification of an earlier phase of the irrigated area (see Banerjea 2025 for the dataset). The analysis confirmed the presence of buried soils and the location of a historic irrigation ditch (*acequia*), which was distinguished through a minor but important difference in particle size (sandy silt loam particle size in channel, SU 6003; sandy clay loam/loamy sand in other buried soil horizons). The buried soil horizons comprise a series of A (surface) and B (sub-soil) horizons, the earliest of which formed at the base on the alluvium and the A horizon was identified in SU 6006, at the base of slide 4b. SU 6004 was identified in the field and overlaid SU 6006. Micromorphological analysis shows that SU 6004 actually consists of a B horizon at its base in slides 4a and 4b and an A horizon further to the top in slides 6a and 6b. There is substantial evidence for bioturbation in these slides in the microstructure, as well as infillings, and earthworm biospheroids occur throughout units in samples 4 and 6, suggesting that there could be several phases of bioturbation (Canti 2017; Kooistra and Pulleman 2018). The A horizon in SU 6004 was also identified in the base of the sample. The irrigation channel appears to have been cut into SU 6004 and the fill of the channel represents it ‘silting up’, i.e. infilling with sediment forming SU 6003. The top of the sediment that infills the channel is the basal unit of sample 7. The channel was probably recut (as channels are still present today), but this is not represented in the excavation trench. The A horizon continued to form over the infilled channel and is represented in SU 6002, the modern agricultural soil.

In comparison to B horizons, the units which are classified as A horizons have a greater abundance of burnt residues and dung, which have been added to the soil as fertilisers (Plate 5.16). The B horizon (SU 6004, slides 4a and 4b) contains greater abundances of fragments of building materials. These coarser, less organic components may have not been worked into the A horizon in the same way as the organic burnt materials and dung. The fertiliser materials represent waste from a range of household, industrial and husbandry activities, possibly taking place in the nearby fortification, and comprise domestic refuse (bone, including burnt, calcined, non-burnt and fish, eggshell, ceramic fragments from tableware), slag, charred wood, omnivore coprolite and herbivore dung fragments. Omnivore coprolite and herbivore dung may have been deposited by animals

being grazed in this field system to increase soil fertility (García-García and Moreno 2018). Livestock were also grazed within the walled area of the citadel at Molina, but this was only evident in the post-medieval strata (Banerjea *et al.* 2019).

Aggregates of water-laid sediment crust (Zhuang *et al.* 2025) occur mainly in sample 3, from the base of the historic irrigation channel, base of SU 6004 (B horizon) and lowest A horizon, SU 6006. These fragments of crust indicate the aggregation of fine (clay) material that has accumulated through slow water inundation (from irrigation), which has subsequently been reworked by several phases of bioturbation and soil forming processes. Aggregates or nodules of calcareous sediment occur in SU 6002, 6003 and 6004 (slides 6a, 6b and 7), which have been reported to occur in soils with long-term historic irrigation derived from calcareous alluvium (Adderley 2018), as is the case with this irrigated field system in Molina. Fragmented rhizolith features, whereby the organic component of root fragments has been replaced by calcite mineral, occur toward the base of the profile in SU 6006, slide 4b; these features have also been observed in Peruvian terraces where there has been deep root bioturbation (Goodman-Elgar 2008). Wetting and drying processes are evident in the soils forming various calcitic pedofeatures developed through dissolution and reprecipitation in calcareous soils under wet or irrigated cultivation (Lang and Stump 2017; Adderley 2018). Few, 2–5%, redoximorphic pedofeatures also occur.

## Andalusia (present day)

### *Upland land use*

The physical geography and climate of Andalusia is varied, characterised by two mountain ranges, the comparatively low-lying Sierra Morena to the north and the Bética Ranges to the south, including the peaks of the Sierra Nevada. Between lies the fertile lowlands of the Andalusian Plains focused on the valley of the Rio Guadalquivir, and fertile coasts to the south of the Sierra Nevada. Present-day land-use maps (Plate 5.17) show that the area of the Sierra Nevada to the east of Granada is characterised by pasture and patches of woodland, which may represent a continuation of historic arboriculture and pasture identified in the pollen record, and irrigated cultivation between Granada and Loja along the Rio Genil (Plate 5.18) with also pasture to the south of Loja and Agicampe (Plate 5.17).

The majority of available data on the environmental history of Andalusia derives from pollen sequences located in upland, high altitude settings, most notably from the Sierra Nevada. There are comparatively few studies from the more intensively settled lowlands. Moreover, most studies cover several thousand years, and specific periods such as the medieval often lack the associated sample



and chronological resolution to distinguish beyond broad trends in vegetation.

The environmental history of this region, as much as Iberia itself, is characterised by millennial scale variability defined by phases of increased aridity (e.g. Bellin *et al.* 2013) and consequent variability in regional climate and vegetation. From Padul located in the Sierra Nevada, there are environmental indicators of arid conditions between AD 400 to 1400, with colder conditions during the post-Roman period and warmer conditions during the Medieval Climatic Optimum.

Multi-proxy analysis of lake sediments at Laguna de la Mosca demonstrated that there was a reduction in tree cover within the Sierra Nevada, associated with peaks in microscopic charcoal brought on by increased aridity from 4000 years ago. The vegetation history of the Sierra Nevada is heavily influenced by climate variability, though in the last 1000 years the pollen sequence from Laguna de la Mosca shows an increase in olive and chestnut reflecting human activity (arboriculture) in high altitude settings. A similar picture is evident from other lakes in the Sierra Nevada, including Laguna de la Mula, showing a period of aridity from AD 100 to 1300, with a decrease in oak and increased fire incidence. A component of the charcoal is likely linked to human activity, but the most marked evidence is considered to relate to mining activity documented during the Roman period (Jiménez-Moreno *et al.* 2013).

Evidence for arboriculture and pastoral activity is also apparent from the pollen sequence from Laguna de Río Seco (Anderson *et al.* 2011), including an increase in chestnut and olive apparent from pre-Roman times.

### Cultivation

The Land of Aynadamar, within the ‘castlescape’ of the Alhambra, is located on high ground on a geological formation comprising conglomerates, sandstones, red clay, marl, limestone and carbonates (Plate 5.2). Again, the present-day excellent soil capacity (Plate 5.8) is in irrigated areas at the valley bottom (Plate 5.19), which, in the medieval period, was supplied by the Channel of Aynadamar. The case study of the Cartuja of Granada (Plate 5.19) has also shown an irrigated space with several terraces in Nasrid time (García-Contreras Ruiz *et al.* 2017), but the most relevant thing that is evident are the large irrigated spaces close to the city such as its Vega (Jiménez Puertas 2012), thus like Vega of Huétor and the Cenes terraces. Also in this case, there are salt mines in the wide Granada basin, more specifically in the territory of Quempe and in the Malahá *alquería*.

The soil micromorphological study of the Land of Aynadamar allows us to delve into both the Nasrid productive strategies and, above all, the transformations, including periods of disuse and reuse, which took place after the Castilian conquest when the landscape of orchards and

vineyards, pools and ditches, was replaced by a centralised model of agriculture of dry land destined to satisfy the demands and commercial needs of the new Christian elite which include the Carthusian monks. The soil micromorphological analysis revealed that the changes arising from the Castilian conquest, which are articulated in documentary sources, took a few decades and were not immediate (Banerjee *et al.* 2024). It shows the processes of change in four areas of Aynadamar covering the 13th to 16th centuries, which encompassed agricultural terraces, an external space in an area occupied by a community of Moriscos (García-García *et al.* 2021), the remains of a *cármenes* (a peri-urban farm) and an *almunia* (small palace) from the Nasrid period.

The soil micromorphological analysis (Banerjee *et al.* 2023, 2024) identified the construction process of agricultural terraces dating to the 15th–16th centuries (from the Castilian conquest) and man-made garden soils adjacent to a structure of Nasrid date. Soil micromorphological analysis indicates that there were two phases of use, and that soil may have been deliberately repurposed from the local surrounding area and deposited onto the terrace ‘cut and fill’ construction (Brown *et al.* 2021, fig. 1). In the first phase, soil from the local surrounding area was repurposed and brought to the terrace as topsoil. The second phase is characterised by a further deposition of soil creating a profile with an A and B horizon. The soils contained fragments of herbivore dung and domestic refuse which may originate from material used as fertiliser. The terrace soils showed indications of chemical alteration and ongoing bioturbation. The occurrence of iron nodules, impregnative redox pedofeatures (Vepraskas *et al.* 2018), probably arose from cycles of wetting and drying (Lang and Stump 2017; Adderley *et al.* 2018). Rhizoliths occur in the soils lower half of the profile (22007a and 22007b), which could indicate deep root bioturbation (Goodman-Elgar 2008). Carbonates are not present in the groundmass of the A-horizon (22007a). Unlike the other units in this profile, it does not have a crystallitic b-fabric and is different in colour, which may be due to an increased humic content and carbonate leaching from weathering. Of note, albeit in soils from the Netherlands, decalcification of topsoils in orchards can occur where there is no earthworm activity (Jongmans *et al.* 2003; Adderley *et al.* 2018), which is absent from A-horizon (22007a).

The 14th-century ‘garden soils’ adjacent to a Nasrid wall (Trench 24.000) share similarities in formation and composition with *terra preta*, which is an anthrosol for cultivation in the Amazon, formed because of enrichment due to the decomposition of habitation refuse (Arroyo-Kalin 2010), European Dark Earths (Devos *et al.* 2022) or garden soils found in urban areas (Davidson *et al.* 2006). The garden soil in Trench 24.000 contains sediment from the local area, anthropogenic inputs comprising charred wood, bone

fragments and building materials, and shows the potential recycling of soil and ongoing pedogenesis. Phytoliths, which could indicate cultivated crops, were not observed in either the terrace or the garden soil, which could be due to poor preservation in alkaline sediments. The ‘garden soils’ do not show the same effects of irrigation as the terrace soils. They have few redoximorphic pedofeatures, but no calcite features. This may suggest that water was used on these soils from the nearby well, rather than from an irrigation system. The garden soil in Trench 24.000 was covered with a further, more sterile soil, which could relate to the disuse of the area during the late 15th to mid-16th centuries. Other abandonment/end-of-life deposits from this period at the end of Nasrid rule were identified elsewhere in Aynadamar, including Nasrid buildings in Trench 29.000 and in proximity to the *almunia* at the top of the hill. The *almunia* was deliberately remodelled and pool infilled in stages. There was a short period of disuse where sediment accumulated, then soils formed *in situ* inside of it on substrate comprising sediment deposited during deliberate infilling which took place before 1640. Further infilling took place after this and included modern material culture. These periods of disuse and deliberate infilling are considered to be contemporary with some of the periods of disuse associated with the pathway to the entrance of the *almunia* (Banerjee *et al.* 2024), which was still thought to be in existence after the Christian conquest of 1492, c. 1520, when a new house was built to the north of the pool.

Further west of Cartuja along the Rio Genil, Torre de Agicampe, an *alqueria* (Plate 5.20), in addition to having demonstrated a Nasrid irrigated space associated with the same settlement (García Porras *et al.* 2020), reveals a proximity to an abundant area of extensive irrigated systems. Some of them such as Frontil or Tajará have been dated early (8th century), while others have developed from the growth of the city of Loja (10th–11th centuries) (Jiménez Puertas 2007). These are linked both to the terraces of the Genil river in the area between Loja and Huétor Tájar, and to the terminations of its tributaries Salar creek and Cacín river. Other important natural resources in its surroundings are the Fuente Camacho salt flats that were exploited in the medieval period. Torre de Agicampe is located in an area which today has unproductive to moderate soil capacity (Plate 5.7), and lies on the same geological formation as Cartuja. In its surrounding area, today, the excellent soil capacity locations (Plate 5.7) are around the river systems, particularly the irrigation systems to the south by the Genil (Plate 5.20). The moderate to good soils (Plate 5.7) are used for woodland (or arboriculture) and pasture (Plate 5.17). The unproductive soil by Agicampe may have been a contributory factor in the medieval period leading to the construction of irrigated terraces around the tower as a strategy for soil retention and amelioration. Two seasons of geoarchaeological fieldwork were conducted in the fields

adjacent to Torre de Agicampe: the first in spring 2018, and the second in October 2018 (García Porras *et al.* 2020). The lower levels of the upslope sondages nearest to the farmhouse produced Nazari pottery, 13th–15th century; whereas the sondage further downslope produced post-15th-century pottery. The spring and October 2018 upslope sondages found the remains of terraces and buried soils at the base of the profile from which geoarchaeological samples were collected.

Soil micromorphological and phytolith analyses were conducted on samples collected in spring 2018 from an upslope sondage; phytoliths are plant microfossils made from silica and are found in some plant tissues and persist after the decay of the plant. The soil micromorphology samples (Plate 5.21) were collected from an upper and lower soil on the terrace, and the phytolith samples were collected from the upper and lower soils and from two 0.5cm columns above the upper and lower terrace soils. OSL samples (Plate 5.21) were collected from the upper and lower soils at the base of the profile on the terrace and returned age estimates of AD 870–AD 1000 for the lower soil (OSL 1) and AD 1120–AD 1250 for the upper soil (OSL 2). The date for OSL 1 should be accepted tentatively owing to significant Uranium disequilibrium; whereas the age estimate for OSL 2 had no analytical issues (Toms 2025). The soil micromorphological and phytolith analyses have characterised and identified terrace soils from the Nasrid period at the base of the profile from the sondage that was sampled in spring 2018. The soils were fertilised using domestic midden material, and there is a strong possibility that they were managed by irrigation and ‘stubble-burning’ to remove old vegetation. Soil micromorphological analysis identified two B-horizons (or sub-soils): one for the upper soil and one for the lower soil. The upper soil also has an A-horizon (top soil); the A-horizon of the lower soil may have been removed by soil erosion, and the profile from the sondage recorded in October 2018 shows that the terrace platform and wall were rebuilt (Plate 5.21). Both soils contain inclusions relating to domestic refuse, which could indicate that midden material was used to improve the soils, as also observed on the irrigated field at Molina de Aragón and the terraces from Aynadamar (Granada). The upper and lower soils both contain fragments of bone and charred wood. The upper soil also contains fragments of coprolites and a fish tooth, and the lower soil contains fragments of eggshell. The reported effects of manuring and liming on soil microstructure are largely explained by increased bioturbation. This can result in the development of crumb microstructure, increased soil porosity, particularly microporosity, and the development of the channel (Adderley *et al.* 2018). The practice of clearing vegetation by managed fire regimes is adopted for many different purposes worldwide. Micromorphological features can include charcoal, burned soil fragments and exotic components

such as phytoliths (Adderley *et al.* 2018), all of which are present in these samples, which lends support to the idea that the terrace system was managed by burning the stubble. Aggregates of burnt soil were only observed in the upper soil and many of the grass-type (that could include cereals) phytoliths that were recovered through extraction are burnt. The direct effects of fire on soil are dependent on the texture and mineralogical composition of the soil and on the intensity, oxygen regime and temperature of the fire (Adderley *et al.* 2018). The soils in this profile have been subjected to ongoing biological reworking and possibly irrigated, which makes temperature determination and estimation of duration of any fire difficult to determine from the observed features in the soil microstructure.

The most commonly reported effects of irrigation on soil microstructure are disaggregation of aggregates and a decrease in porosity. This structural degradation was most pronounced in clay-rich soils. Infilling of pores by disaggregated materials also led to a decrease in porosity (Adderley *et al.* 2018). Microstratigraphic Unit (henceforth MU)1 and MU3 in both the upper and lower soils have compound packing voids and an intergrain aggregate related distribution, which forms where the finer sediment infills the void spaces between coarser components. As this is an upland cultivation system, comparing this decrease in porosity with those features recorded in wet cultivation of rice (in Adderley *et al.* 2018) to determine irrigation is approached with caution here. There are also pedofeatures that could also indicate irrigation. The upper and lower soils at Agicampe show reprecipitated gypsum. In irrigated calcareous or saline soils, various pedofeatures may develop through dissolution and reprecipitation, such as impregnative calcitic features (Adderley *et al.* 2018). In soils under wet rice cultivation, impregnation and depletion of pedofeatures of iron and manganese oxides are common features (Adderley *et al.* 2018). The formation of amorphous iron nodules and reformed manganese nodules is observed in the upper and lower soils, which can indicate alternating wetting and drying of the soils (Adderley *et al.* 2018; Vepraskas *et al.* 2018).

Further to the south-west, less evidence is available to spatially assess cultivation around Tebá and Cártama. Tebá does not have an irrigation system nearby; while in Cártama there are two irrigation ditches, but it is uncertain whether they date from the Andalusian period.

At Cártama, the identification of a broad range of plant remains in the deposits (Banerjee *et al.* submitted) dating to the 13th century (from a *fumier* sequence discussed below) demonstrate the integral relationship between plants and animals (García-García and Moreno-García 2018). In the plant macrobotanical record, the presence of pearl millet (*Pennisetum glaucum*) and sorghum (*Sorghum bicolor*) is particularly noteworthy, as these are medieval Muslim introductions that remain rare in the Iberian Peninsula (Pérez-Jordà *et al.* 2024). The integrated phytolith and soil

micromorphological analyses also provided an insight into agrarian technology where one of the samples produced an articulated silica skeleton of millet (Banerjee *et al.* submitted, fig. 10h) that had been cut by a threshing sledge (Anderson 2003). Although the pollen in these deposits mostly reflects the fodder composition and the animal diet (herbs), it also captures the existence of mixed oak forests characterised by cork oak in association with lime trees around the site. Sporadic pollen of pine was probably transported over larger distances (a few tens of km) and higher elevations. Arecaceae phytoliths were prevalent in the assemblage from the *fumier* sequence and the dwarf palm, *Chamaerops humilis*, occurs in the macrobotanical assemblage (charred seed and stipe) and, it is thought that palms were the main fuel used as tinder to start the fire to burn the dung (Banerjee *et al.* submitted).

### Pastoral activity

Pastoralism is an exceptionally opaque reality in written documentation and rarely appears in these sources (García-García and Moreno-García 2018). The livestock of the former kingdom of Granada is the best known in al-Andalus due to the relative abundance of written documentation generated during the Nasrid period and the period immediately following the Castilian conquest, expanded by a growing *corpus* of recent zooarchaeological research (eg. García-García 2017, 2023; Grau-Sologestoa 2017) and isotopic studies (e.g. Alexander *et al.* 2019; Inskip *et al.* 2019).

In addition to pastoral activity in the uplands evidenced through palynology, the application of soil micromorphology is a well-established research technique for identifying and interpreting *in situ* stabling deposits on archaeological settlements (e.g. Polo-Díaz and Fernández Eraso 2010; García-Suárez *et al.* 2018; Banerjee *et al.* 2020; Banerjee *et al.* 2021; Polisca *et al.* 2025) and is applied to a series of deposits in this study from a profile at Cártama, in conjunction with the analysis of plant macroremains, phytoliths, pollen, non-pollen palynomorphs (NPPs) and faecal lipid markers (Banerjee *et al.* submitted). The multidisciplinary micro- and bioarchaeological analyses of 13th-century Almohad deposits from suburban Cártama, Málaga, Spain, have, for the first time, confidently identified open-air *fumier* deposits. *Fumier* (French) translates to ‘dung’ or ‘manure’ and it refers to animal waste, such as excrement from stables and barnyards. In archaeology, *fumier* sequences (overlapping of burnt and unburnt sedimentary layers) play a primary role in the study of livestock management and the use of space in prehistoric pastoralist societies in sheepfold caves and rock shelters (Brochier *et al.* 1992; Macphail *et al.* 1997; Angelucci *et al.* 2009; Alonso-Eguiluz *et al.* 2017, 2024; Morandi 2020). The integrated analyses identified the presence of dung, livestock alimentation, *in situ* depositional and burning processes, and indications of trampling, which make the case for this feature (UE 354) being a small corral, where livestock sheltered



taking advantage of the hollowness of a ‘robber trench’, occupying an area of approximately 4.00m × 3.40m. This demonstrates that Andalusi livestock husbandry practices included periodically burning animal dung within corrals and pens, which is a long-standing practice in the Mediterranean region also observed in prehistoric transhumance. The site itself is situated in an area of pastoral land use (Plate 5.22).

### Summary of multi-scalar approaches

Despite the variability in coverage of the sources of data that are available across al-Andalus for this period, it has been possible to successfully glean multi-scalar information about cultivation, pastoralism and the use of pasture and forestry in both Islamic and Christian contexts.

At the microscale, it has been possible to identify micromorphological features of agricultural practice, which come with the caveat that experimental research is required to examine these processes in soils across the Iberian Peninsula. Irrigation practices from both the Nasrid and Christian periods have been identified. Upland terrace irrigation, without water saturation, is evident at Agicampe, with an OSL age estimate of AD 1120–AD 1250 for the second phase of soil directly on the terrace, placing it in the late Almohad–early Nasrid dynasty, with material culture deriving from soil amelioration spanning the 13th–15th centuries. The unproductive soil by Agicampe may have been a contributory factor in the medieval period leading to the construction of irrigated terraces around the tower as a strategy for soil retention and amelioration, as observed across the Mediterranean (Brown *et al.* 2025). Soil micromorphology revealed terrace erosion and recording of the terrace profile in spring 2018 showed that it had been rebuilt. GIS and cartographic analysis showed that Torre de Agicampe is located in proximity to an irrigated area linked both to the terraces of the Genil river in the area between Loja and Huétor Tájar, and to the terminations of its tributaries Salar creek and Cacín river, some of them as Frontil or Tajará have been dated early (8th century), while others have developed from the growth of the city of Loja (10th–11th centuries).

Another panorama offers the area of Granada during the Andalusian Nasrid era (Plate 5.18), whose settlement has an important connection with the areas of irrigated crops, both linked to the Vega of Granada and the valleys that flow into it, all areas of excellent soils. The soil micromorphological study of the ‘Land of Aynadamar’ (Banerjea *et al.* 2024), showed that the 14th-century ‘garden soils’ (in an area later occupied by a community of Moriscos) do not show the same effects of irrigation as the later, 15th–16th century, Christian terrace soils, as a nearby well may have been used. This is an interesting observation as the written sources after the Castilian conquest refer to the landscape of orchards and vineyards, pools and ditches being replaced by a centralised

model of agriculture of dry land destined to satisfy the demands and commercial needs of the new Christian elite which include the Carthusian monks (Torres Martín 2007). The soil micromorphological study of the terrace soils indicates that substantial upland irrigation took place with some evidence in the earliest soils that is comparable with orchard soils and deep root bioturbation. This could indicate that dryland agriculture was not yet established when the terrace was constructed and may have been established post-16th century when the second phase of the terrace was constructed (Banerjea *et al.* 2024). In the first phase, soil from the local surrounding area was repurposed and brought to the terrace as topsoil. The second phase is characterised by a further deposition of soil creating a profile with an A and B horizon. This mode of construction has also been observed from an early Islamic terrace at Ricote, Murcia (Puy and Balbo 2013), which shows that there is some continuity in using established construction techniques. The soil micromorphological evidence for soil amelioration in Molina de Aragón (irrigated field), Aynadamar (‘garden soils’ and agricultural terrace) and Agicampe (agricultural terrace) is very similar with domestic refuse, ceramics and building materials used. Dung was observed in the irrigated field soils at Molina de Aragón, which could indicate field grazing by livestock (García-García and Moreno García 2015). There is some evidence that the terrace system was managed by burning the stubble at Agicampe.

Evidence of irrigated agriculture from the Christian conquest was recovered at Molina de Aragón in an extension of the agricultural land use around the castle. The terrace system adjacent to the castle was established AD 930–AD 1160, indicated by OSL dating. The ceramic chronology shows that the material from the earliest soils in the irrigated field system by the river Gallo dates to the feudal period between 12th–15th centuries AD. The historic irrigation channel and earliest soils were identified, and the soil micromorphological evidence shows long-term historic irrigation derived from calcareous alluvium has deep root bioturbation (Goodman-Elgar 2008), and the aggregation of fine (clay) material that has accumulated through slow water inundation (from irrigation). There are various calcitic pedofeatures developed through dissolution and reprecipitation in calcareous soils under wet or irrigated cultivation (Lang and Stump 2017; Adderley 2018). Where at Cartuja we see a gradual transition to dry agriculture with a gradual reconfiguration of Aynadamar, at Molina de Aragón, the irrigated field system is still in use today, and although the Islamic terrace has been abandoned, terracing still continues in the local area. GIS mapping shows that in the province of Guadalajara there are heterogeneous lands where there are some plots of land with excellent soil capacity. In the case of Molina de Aragón they are structured around the Gallo river and in the case of Atienza they are generated near streams in the open land around the village.

The latest maps attempt to interpolate the settlement with the different resources in addition to associating at the same time the capacity for use of the land in the territory. In the case studies of Guadalajara (Plate 5.23), it is observed how during the Islamic era the settlement of Atienza was close and connected to the salt mines (García-Contreras Ruiz 2021), which raises the suspicion of inland salt mine exploitation by the Andalusian communities that lived in these lands. Regarding the feudal era in Guadalajara (Plate 5.24) we can see how the Atienza salt flats will continue to be used (García-Contreras Ruiz 2021), and how in the territory of Molina, one of the most used resources is metallurgical (Hernández-Casas 2022), although in both cases there is more diversification with the cultivation of some irrigated cultivation spaces associated with good lands, especially along river courses. The wider synthesis of pollen data from Guadalajara shows land use and clearance intensifying into the medieval period. Settlement intensification during the 12th–13th centuries is apparent in both upland and lowland landscapes, with increasing land-use evidence in palynological sequences. Woodland clearance increases in mountainous areas used for seasonal pastoralism with cultivation of rye, olive and sweet chestnut apparent from lowland environments and evidence for an increase in olive is apparent around Atienza, which is characterised by a deforested landscape around the 5th century AD. The pollen record reflects the landscape transformation that occurred between the late Middle Ages and the early modern period. The development of livestock farming documented since the late 13th century AD had favoured a partially forested landscape in which some type of agroforestry system could be implemented.

Diversely to the area of Granada, for the Nasrid period around Cártama and Teba (Plate 5.25), there is a connection of settlement with exploitation of the lesser productive lands, which may indicate more livestock strategies and fruit orchard and dryland areas. It is noteworthy that the soil micromorphological and micro botanical evidence for livestock management and alimentation from Cártama is unlike any of the other case studies in this project, adding support for this hypothesis and inferring Andalusi livestock husbandry practices included periodically burning animal dung within corrals and pens, which is a long-standing practice in the Mediterranean region also observed in prehistoric transhumance. In Granada (Plate 5.26), some changes can be seen in lowland areas (Martínez Vázquez 2016), although the big change that we can see is in the mountain areas that previously occupied the border area. It is in this territory that we can observe how a high number of farmhouses (*cortijo*) arise (Luna Díaz 1989), that are installed on marginal lands or with little productivity, land that has been obtained by obtaining new cultivation spaces for the dry land by clearing certain areas next to the farmhouses. In the territory of Málaga (Plate 5.27), changes similar to

Granada are perceived, with the constitution of Villas where there were fortifications and other villages in areas with more livestock and dryland resources.

As discussed, the majority of available data on the environmental history of Andalusia derives from pollen sequences located in upland, high-altitude settings, most notably from the Sierra Nevada, and there are comparatively few studies from the more intensively settled lowlands and with low chronological resolution. The vegetation history of the Sierra Nevada is heavily influenced by climate variability, though in the last 1000 years the pollen sequence from Laguna de la Mosca, like Pelagallinas and Cañamares (Atienza) shows that there is an increase in human activity and evidence for land use. A similar picture is evident from other lakes in the Sierra Nevada, including Laguna de la Mula, showing a period of aridity from AD 100 to 1300, with a decrease in oak and increased fire incidence. Evidence for arboriculture and pastoral activity is also apparent from the pollen sequence from Laguna de Río Seco (Anderson *et al.* 2011). More widely, in Murcia, environmental data from a lowland coastal setting (Azuara *et al.* 2020), shows that the 11th and 12th centuries are characterised by deforestation and evidence for pastoralism, associated with the growth of Murcia and a period of economic growth. There is no evidence for reforestation in the late medieval and post-medieval periods, despite Christian control of Murcia, as with Andalusia, seeing the repression and reduction of Muslim populations in the region. This is argued to have led to a more specialised land use strategy involving extensive livestock farming, maintaining open habitats in the region.

## Concluding remarks

This review of land use in Iberia during the Islamic and Christian states provides a foundation for future research applying multi-scalar techniques to understand nuances in land-use change and continuity. Variability in open-source data for land use, the suitability of coring locations for palaeoenvironmental reconstruction and the number of current geoarchaeological studies in the Iberian Peninsula for this period are all factors that need to be addressed as this area of research starts to gain momentum.

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# Towards a narrative change? New archaeobotanical research on the ‘Green Revolution’ at the heartlands and frontiers of al-Andalus

*Jérôme Ros, Nicolás Losilla, Thierry Pastor and Camille Hervy*

## Introduction

### *Identifying plants, practices and agrarian systems in medieval Iberia: A longstanding quest*

Since Andrew Watson (1983) established his influential thesis of the ‘Arab Agricultural Revolution’ or the ‘Green Revolution’, the agrarian history of the medieval West has been connected to the westwards expansion of Islam. Watson linked the presence of Arab (and later Berber) migrants in the central and western Mediterranean with the exploitation of a greater diversity of useful plants (dissemination of new species, development of varieties), the introduction of new irrigation techniques, the intensive use of organic fertilisers and the development of summer crops (Albertini 2013). Subsequent works have moderated the revolutionary nature of this new agrarian dynamic, criticising Watson’s bias towards the innovative role of Arab agricultural techniques and his overly linear vision of the spread of ideas and goods, which devalues the technical and botanical knowledge inherited from Greco-Roman, Byzantine and Babylonian agronomic traditions (e.g. Decker 2009; Squatriti 2014). But despite this, 50 years on, Watson’s thesis is still the benchmark, constituting a kind of dogma that today’s researchers are constantly seeking to reinforce, overturn or nuance (e.g. Ramsay and Holum 2015; Fuks *et al.* 2020; Mir-Makhamad and Spengler 2023; García-Contreras Ruiz *et al.* 2025).

In the Iberian Peninsula, medieval agriculture has been the subject of dynamic studies for several decades, and has led, for example, to the emergence of the series ‘Ciencias de la naturaleza en al-Andalus’ published between 1990 and 2004 by the CSIC, which included numerous articles on agronomy and agriculture. This series, which is part of a long tradition of publications based on the study of Arab-Andalusian textual sources, has provided valuable information on agronomic traditions and affiliations, plants

and their cultivation methods, with ramifications for the study of their medical, pharmaceutical and culinary uses (e.g. García Sánchez 1981–1982, 1983–1986; Carabaza Bravo and García Sánchez 2001; Álvarez de Morales 2002). But these contributions suffer from a number of biases, not least the heterogeneous nature of the textual sources used, in terms of chronology, geography and social background, offering an approach to Andalusian food and agrarian strategies from a specific sphere: that of the social and intellectual elite made up of scientists, agronomists, doctors, etc. In this sense, our knowledge of medieval agriculture is sometimes thought to be homogeneous, as if the Peninsula were an unbreakable whole, although certain areas and chronologies are poorly or not at all documented by textual sources.

In order to overcome the possible bias in this field of study, it was essential to consider the very basis of agriculture by studying material remains, as already highlighted by Pierre Guichard (1985). This search for agricultural ‘reality’ began with the identification of medieval urban and rural settlements, through surveys and excavations, with a reflection on landscape and resource management practices (e.g. storage, cooking) and of the hydraulic systems associated with irrigation, such as ditches and qanats (e.g. Bazzana and De Meulemeester 2009; Eiroa Rodríguez 2010; Martín Civantos 2011). The latter have long been considered as key elements in the spatial organisation of agrarian spaces, focusing the heart of the debate on irrigated agricultural systems and their innovative role, often leaving in the background the question of the survival of rain-fed agricultural systems during the Islamic period (Eiroa Rodríguez 2010). It is particularly striking that this research has often ignored the very reason that led to the construction of these hydraulic systems: the specification of tangible irrigated crops, over and above the data once again provided by textual sources (Trillo San José 2004).



### ***Archaeobotany, or the search for the materiality of past agriculture***

The archaeobotanical approach, which focuses on all plant parts that can be preserved in an archaeological context, in dry, charred, waterlogged or mineralised form, whether macroscopic remains (wood, charcoal, stems, seeds, fruit, flowers, leaves, buds) or microscopic (pollen grains, phytoliths, starch), is a way (although not the only one) of generating concrete data, interpretable according to a historical approach. Carpology, the study of plant macro remains (with the exception of wood), is particularly useful for documenting ancient agrarian systems. As a result of precise taxonomic identifications, which can often reach the level of species, and their ability to be preserved in a wide variety of contexts, it is possible to reconstruct the range of plants that were consumed, cultivated or exploited by different social groups. Taking into consideration the archaeological structures from which they have been extracted helps to distinguish traces of consumption, cooking, processing, storage, fuel or artisanal residues. In other words, these remains enable us to ask fundamental questions regarding the exploitation of plants, related husbandry, harvesting and processing practices and agrarian spaces.

Carpology of the medieval Iberian Peninsula is a fast-growing field, but one that has long remained marginal compared with that of the prehistoric, protohistoric and ancient periods (e.g. Zapata *et al.* 2004; Pérez-Jordà and Peña-Chocarro 2024). In 2019, there were around 40 studied medieval sites in the whole of the Peninsula (Peña-Chocarro *et al.* 2019; Ros *et al.* 2019), while in neighbouring regions such as France, there were, fifteen years ago, more than 250 (Ruas 2010). There are many reasons for this difference, including (1) the belief that we already know everything about medieval agriculture from texts; (2) a lack of dissemination among archaeologists to explain the value of the archaeobotanical approach; (3) the lack of systematic bioarchaeological sampling during archaeological excavations; (4) the small number of specialists in post; and (5) their greater involvement in earlier periods. But this situation is rapidly changing, and the last few decades have seen a fast expansion of archaeobotany, particularly in the regions corresponding to the medieval Christian kingdoms of the northern Peninsula (e.g. Quirós-Castillo *et al.* 2020). In the Andalusi areas of the Peninsula, the situation remains variable. Until very recently, the archaeobotanical approach focused more on case studies, particularly at the scale of a site or locality (e.g. Alonso *et al.* 2014; Ros *et al.* 2018), and, very occasionally, on regional syntheses, such as in the Levante and the Murcia area (Eiroa Rodríguez 2010; Azuar Ruiz 2015). In this sense, the AHRC Landscapes of (Re)Conquest project was the first to document the material reality of medieval Peninsular agriculture on such a large spatial scale, including an inter-regional comparison of data obtained from the project's case study sites, presented below. Since then, the number of funded projects on this theme has multiplied,<sup>1</sup> making it possible to imagine, within the next five

years, an upheaval of everything we thought we knew about agrarian systems in medieval Muslim and Christian Iberia.

This study documents the diversity of Andalusi agricultural production and practices in different regions of the Iberian Peninsula between the 11th and the 14th centuries, based on unpublished case studies from the Landscapes of (Re)Conquest project and pre-existing published data. At the heart of this research lies the question of agricultural innovations that are widely associated in the scholarly literature with the Arab-Berber expansion across Iberia. The most recent overviews spoke for themselves: none of the crops of the medieval 'Green Revolution' mentioned in the texts (e.g. cotton, sugarcane, spinach, eggplant, etc.) had been discovered (Peña-Chocarro *et al.* 2019; Ros *et al.* 2019), and it is only in the last two years that new taxa (e.g. citrus fruits, rice) have begun to appear in Andalusi archaeological contexts in Iberia, on a very occasional basis (Peña-Chocarro and Pérez-Jorda 2023; Peña-Chocarro *et al.* 2024).

These data raise the question of the real expansion of Arab-Berber agriculture in the West, and of the 'new plants' and their rhythm of diffusion: was this really a uniformly widespread phenomenon throughout the entire medieval Muslim West? Or was it limited to the landed estates of the urban aristocracy and to the large areas of specialised production (e.g. al-Andalus), well known from written sources? Focusing on Iberia, did the areas at the frontiers of Andalusi territories continue to practice agriculture that was strictly identical to that of the Roman and/or Visigothic periods? Or did they experience similar trends to those in neighbouring Christian territories, i.e. a boom in rye and certain spring crops (e.g. millets, flax, hemp) (Ros *et al.* 2023)? This innovative research lays the foundations for a new reflection on the persistence and evolution of the production and management of plant resources in the face of the major political, social and economic changes that took place in the Peninsula during the medieval period. They also highlight an otherwise neglected topic in the field of archaeobotany – the contrasting agrarian dynamics of political heartlands and frontiers.

### **Material and methods**

In total, 66 new samples corresponding to 66 stratigraphic units were studied: 9 from Pla d'Almata (Catalonia), 11 from Atienza (Guadalajara), 36 from Molina de Aragón (Guadalajara), 6 from Moraleda (Málaga) and 4 from Cártama (Málaga) (Fig. 6.1). Most of these sites were situated within a frontier territory at different times, although Moraleda and Cártama were located in political heartlands until the late 15th century. All the samples derived from contexts of Andalusi occupation, between the 11th and 14th centuries. Sampling was preferentially based on the presence of charcoal fragments or on the identification of concentrations of ashes visible at the time of excavation. In order to test the carpological potential of different features, random sampling

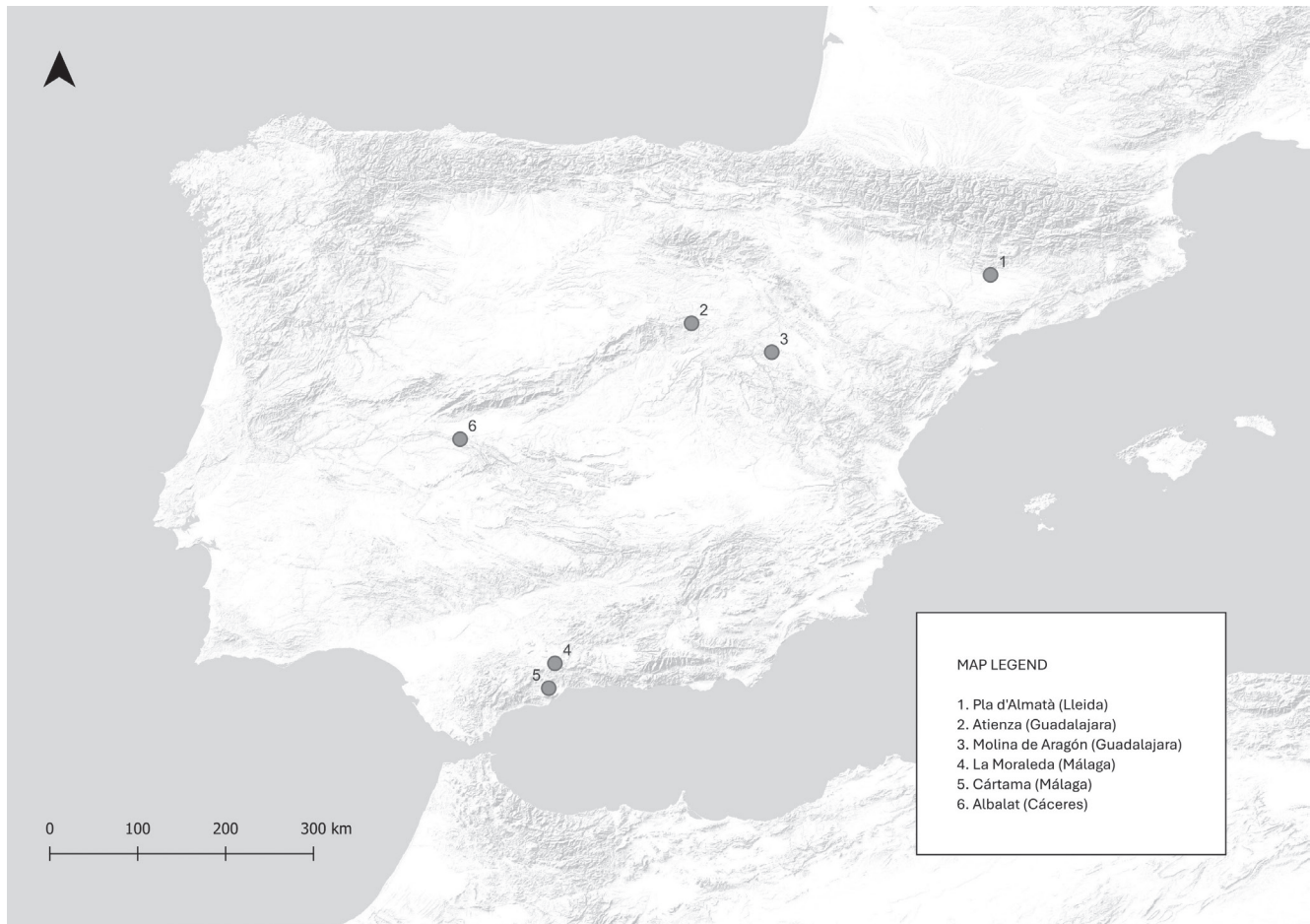


Fig. 6.1. Map of Spain showing the sites that have been the subject of a carpological study during the Landscapes of (Re)Conquest project



Fig. 6.2. Steps of the carpological analysis (sampling, sieving with a flotation machine, letting the sieving residues dry, extracting and identifying the carpological remains, separating the remains by taxa and type of remains)

was also carried out, selecting various types of contexts in order to obtain a greater representation from areas with high footfall, domestic hearths, rubbish dumps, latrines and silo fills. The diversity of studied contexts is not homogeneous from one site to another, which is taken into consideration when making comparisons between sites and regions.

In all sites, the protocol for extracting the remains consisted of sieving the sediments by flotation on 2mm and 250µm meshes (Fig. 6.2), a method that allows the collection of charcoal fragments and seeds of very different sizes and

shapes and limits the biases in the representativeness of the carpological assemblages that can be preserved (Marinval 1999). Due to the nature of the deposits and in order to save water reserves, sieving was carried out with the help of home-made flotation machines, operated by a domestic electric pump. In several settlements, the discovery of contexts with mineralised carpological remains meant that part of the sieving had to be carried out underwater (2mm and 250µm meshes), without flotation, as mineralised remains tend to float rather poorly.

The extraction and identification of the archaeological seeds were carried out with the aid of a Nikon SMZ645 stereoscopic magnifying glass, with magnifications ranging from  $\times 6.5$  to  $\times 10$ . As an anatomical comparison was required for the observations and identifications of the carpological remains, this phase of the work was subsequently carried out in the laboratory of UMR 5554 (ISEM, Montpellier, France). The reference collection of fresh and archaeological seeds was used, as well as seed atlases, flowers and several

publications: Jauzein 1995; Cappers *et al.* 2006; Jacomet 2006; Sabato and Peña-Chocarro 2021.

### New results

A total of 2,484 carpological remains were sorted from the samples (Table 6.1). Some samples provided very few remains, at times less than 10. Despite the scarceness of the remains from some sites, which limits the information on

Table 6.1. List and quantification of cultivated/gathered plants and weeds carpological remains (fg = fragment)

|                                   | Region            | Cataluña     | Guadalajara | Guadalajara      | Malaga   | Malaga        |
|-----------------------------------|-------------------|--------------|-------------|------------------|----------|---------------|
|                                   | Settlement        | Pla d'Almata | Atienza     | Molina de Aragón | Moraleda | PCPPA Cártama |
|                                   | Number of samples | 9            | 11          | 36               | 6        | 4             |
|                                   | volume (L.)       | 149.1        | 276.6       | 90               | Unk.     | 32            |
| <b>CHARRED REMAINS</b>            |                   |              |             |                  |          |               |
| <b>Cereals (grains+chaff)</b>     |                   |              |             |                  |          |               |
| <i>Avena sp.</i>                  | grain             | -            | -           | 4                | 3        | 3             |
|                                   | grain fg.         | -            | 2           | -                | 4        | 3             |
| <i>Hordeum vulgare</i>            | grain             | -            | 20          | 15               | 16       | 11            |
|                                   | grain fg.         | 3            | 27          | 10               | 22       | 9             |
|                                   | rachis seg.       | -            | -           | -                | 4        | 4             |
| <i>Panicum miliaceum</i>          | grain             | -            | 6           | -                | -        | 3             |
| <i>Pennisetum glaucum</i>         | grain             | -            | -           | -                | 3        | 1             |
| <i>Pennisetum/Sorghum</i>         | grain             | -            | -           | -                | -        | 2             |
| <i>Secale cereale</i>             | grain             | -            | 4           | 9                | -        | -             |
|                                   | grain fg.         | -            | 3           | 1                | -        | -             |
|                                   | rachis seg.       | -            | -           | 2                | -        | -             |
| cf. <i>Secale</i>                 | grain             | -            | 1           | -                | -        | -             |
| <i>Secale/Triticum</i>            | grain             | -            | 1           | 2                | -        | -             |
|                                   | grain fg.         | -            | 1           | 2                | -        | -             |
| <i>Triticum aestivum/turgidum</i> | grain             | 3            | 45          | 29               | 24       | 20            |
|                                   | grain fg.         | -            | 31          | 8                | 21       | 6             |
|                                   | rachis seg.       | 1            | -           | 7                | -        | -             |
| <i>Triticum type durum</i>        | rachis seg.       | -            | -           | -                | 1        | -             |
| <i>Triticum monococcum</i>        | grain             | -            | -           | -                | 1        | 233           |
|                                   | grain fg.         | -            | -           | -                | -        | 259           |
|                                   | furca             | -            | -           | -                | -        | 5             |
| <i>Triticum sp.</i>               | grain             | -            | -           | 2                | 1        | -             |
|                                   | grain fg.         | -            | -           | -                | 1        | -             |
| Cerealía                          | grain             | -            | -           | 54               | 2        | 1             |
|                                   | grain fg.         | 42           | 22          | 2                | 17       | 7             |
| <b>Pulses</b>                     |                   |              |             |                  |          |               |
| <i>Lathyrus cicera</i>            | seed              | -            | -           | -                | 2        | -             |
| <i>Lathyrus/Pisum</i>             | seed fg.          | -            | -           | 1                | -        | -             |

(Continued)



Table 6.1. List and quantification of cultivated/gathered plants and weeds carpological remains (fg = fragment) (Continued)

|                                    | Region            | Cataluña     | Guadalajara | Guadalajara      | Malaga     | Malaga        |
|------------------------------------|-------------------|--------------|-------------|------------------|------------|---------------|
|                                    | Settlement        | Pla d'Almata | Atienza     | Molina de Aragón | Moraleda   | PCPPA Cártama |
|                                    | Number of samples | 9            | 11          | 36               | 6          | 4             |
|                                    | volume (L.)       | 149.1        | 276.6       | 90               | Unk.       | 32            |
| <i>Lens culinaris</i>              | seed              | -            | -           | -                | 1          | -             |
| cf. <i>Lens</i>                    | seed              | -            | -           | 1                | -          | -             |
| cf. <i>Pisum</i>                   | seed fg.          | -            | -           | 2                | -          | -             |
| Fabaceae (big seeds)               | seed fg.          | 1            | 1           | -                | 5          | -             |
|                                    |                   | 1            | 1           | 4                | 8          |               |
| <b>Fruit trees</b>                 |                   |              |             |                  |            |               |
| <i>Ficus carica</i>                | seed              | -            | 33          | -                | 2          | 1             |
|                                    | seed fg.          | -            | 1           | -                | -          | -             |
| <i>Olea europaea</i>               | stone fg.         | -            | -           | -                | 10         | 5             |
| cf. <i>Olea</i>                    | stone fg.         | -            | -           | -                | 2          | -             |
| <i>Pinus pinea</i>                 | fg. coque         | -            | -           | -                | 1          | -             |
| <i>Prunus</i> cf. <i>domestica</i> | stone fg.         | -            | -           | -                | -          | 1             |
| <i>Prunus dulcis</i>               | stone fg.         | -            | -           | -                | 1          | -             |
| <i>Prunus</i> sp.                  | stone fg.         | -            | -           | -                | 1          | -             |
| cf. <i>Prunus</i>                  | stone fg.         | -            | -           | -                | 1          | -             |
| <i>Punica granatum</i>             | seed              | -            | -           | -                | -          | 1             |
| <i>Vitis vinifera</i>              | seed              | -            | -           | 2                | 1          | -             |
|                                    | seed fg.          | 5            | -           | -                | 2          | 10            |
|                                    | pedicel           | -            | -           | 1                | -          | -             |
|                                    |                   | 5            | 34          | 3                | 21         | 18            |
| <b>Oily/tecnic plant</b>           |                   |              |             |                  |            |               |
| <i>Linum usitatissimum</i>         | seed              | -            | -           | -                | 2          | -             |
| <b>Wild plants</b>                 |                   |              |             |                  |            |               |
|                                    | seeds and fg.     | 27           | 46          | 396              | 33         | 8             |
| <b>MINERALISED REMAINS</b>         |                   |              |             |                  |            |               |
| <b>Fruit trees</b>                 |                   |              |             |                  |            |               |
| <i>Ficus carica</i>                | seed              | 3            | -           | -                | 1          | 18            |
|                                    | seed fg.          | 7            | -           | -                | -          | -             |
| cf. <i>Punica granatum</i>         | seed fg.          | 2            | -           | -                | -          | -             |
| <i>Rubus fruticosus</i>            | stone             | -            | -           | -                | 1          | -             |
| <i>Vitis vinifera</i>              | seed              | 58           | -           | -                | -          | -             |
|                                    | seed fg.          | 18           | -           | -                | -          | -             |
| <b>Oily/tecnic plant</b>           |                   |              |             |                  |            |               |
| <i>Camelina sativa</i>             | seed              | 1            | -           | -                | -          | -             |
| <b>Wild plants</b>                 | seeds and fg.     | 625          | 1           | -                | 1          | -             |
|                                    | <b>Total</b>      | <b>802</b>   | <b>280</b>  | <b>557</b>       | <b>216</b> | <b>629</b>    |

actual farming practices, the inclusion of all available data provides a comprehensive picture of the exploited crops, both annual and perennial. Taxa include at least 19 cultivated/gathered plants corresponding to 7 cereals, 2 pulses, 2 oil/textile plants and 8 cultivated/gathered fruit trees (Fig. 6.3).

### Cereals

A total of 1046 cereal remains were identified. In this corpus, barley (*Hordeum vulgare*) and wheat (*Triticum aestivum/turgidum*) are the most common cereal species, appearing in each settlement. The studied samples do not allow us to



Fig. 6.3. Charred and mineralized archaeobotanical remains: (1) *Hordeum vulgare* (grain); (2) *Hordeum vulgare* (rachis fragment); (3) *Secale cereale* (grain); (4) *Triticum aestivum/turgidum* (grain); (5) *Pennisetum glaucum* (grain); (6) *Triticum monococcum* (grain); (7) *Vitis vinifera* (seeds); (8) *Ficus carica* (seeds); (9) *Punica granatum* (seed); (10) *Prunus dulcis* (stone fragment); (11) *Olea europaea* (stone fragment). Photographed using a Leica MZ75 with Capture V2.3

assess any real differences in abundance between the sites, as wheat and barley were never represented by more than 100 remains at each site. These are essentially grain remains, with rachis fragments present only very anecdotally and always in small numbers (fewer than ten remains). Concerning naked wheat, the identification of well-preserved rachis segments at Moraleda confirmed that the tetraploid type (*durum* type) was exploited.

The other cereals are only present at two sites each: rye (*Secale cereale*) at Atienza and Molina de Aragón, proso millet (*Panicum miliaceum*) at Atienza and Cártama, and einkorn (*Triticum monococcum*) and pearl millet (*Pennisetum glaucum*) at Moraleda and Cártama. All of these cereals are present only in the form of grain, apart from rye, which yielded a few rachis fragments at Molina de Aragón, and einkorn, which yielded a few furcas at Cártama. Finally, oat grains were found in four of the five settlements, but since it is impossible to tell from the grains alone whether it is the cultivated species (*Avena sativa*) or a wild species (e.g. *A. fatua*, *A. strigosa*) (Jacomet 2006), its status remains unknown.

### Pulses

Pulses were less frequently identified in the samples, and never found in large quantities: between one to eight remains each were found at each site, with a total of fourteen encountered pulse remains in the whole corpus. Only two species have been identified with any certainty: red pea (*Lathyrus cicera*), distinguished from grass pea (*Lathyrus sativus*) by the small size of the seeds found (Kroll 1983), and lentil (*Lens culinaris*). The other remains, fragmented or damaged, cannot be identified to genus level (*Lathyrus/Pisum*, cf. *Lens*, cf. *Pisum*). With the exception of Cártama, all the sites yielded at least one cultivated pulse remain.

### Oil/textile plants

As plant remains were mostly preserved by charring, oil seeds are rare and in a poor state of preservation. The presence of flax (*Linum usitatissimum*) was detected at Moraleda, but only by two seeds. Concerning gold-of-pleasure (*Camelina sativa*), only one mineralised seed was recovered at Pla d'Almata.

### Fruit trees

The presence of carbonised and mineralised contexts has helped to preserve an interesting diversity of fruit trees. A total of 189 remains (81 carbonised, 108 mineralised) were recorded, enabling seven taxa to be identified. The grapevine (*Vitis vinifera*) and the fig tree (*Ficus carica*) are the two most common fruit trees, each appearing on four of the five sites in the corpus. The fig tree is only absent from Molina de Aragón, and the grapevine from Atienza, although charcoal fragments of the species are documented (Larrieu ongoing<sup>2</sup>). Both taxa are mainly recorded as seeds, but the presence of a *Vitis* pedicel is noted at Molina de Aragón.

The presence of other fruit taxa is more sporadic. The olive tree (*Olea europaea*) is identified in the two sites of the Málaga region (Moraleda, Cártama), while the other fruit taxa appear with certainty only once, whether it be umbrella pine (*Pinus pinea*), blackberry (*Rubus fruticosus*), almond (*Prunus dulcis*), domestic plum (*Prunus* cf. *domestica*) or pomegranate (*Punica granatum*). The presence of the latter is confirmed at Cártama but only suspected at Pla d'Almata, where the mineralised nature of the remains limits identification.

### Wild plants

As part of this study, we focused on identifying and quantifying the remains of cultivated or consumed plants. As wild plants were not the subject of in-depth work, we made an initial assessment of the diversity present at each site.

The taxonomic diversity of wild plants varies greatly depending on the studied site: 32 taxa at Pla d'Almata (8 identified with the species level), 24 at Atienza (4 with the species level), 16 at Molina de Aragón (1 with the species level), 12 at Moraleda (5 with the species level) and 4 at Cártama (1 with the species level), for a total of 61 wild taxa identified (18 with the species level). Only the plants identified with the species level will provide information concerning farming practices (seasonality of crops, cutting height, soil characteristics such as humidity, acidity, content of nutrients, etc.). But, as we can see, the data is very uneven from one site to another, which means that it will not necessarily be possible to investigate these issues in depth for each site and then compare them with each other. The list of the taxa identified to species level is: blue woodruff (*Asperula arvensis*), yellow bugle (*Ajuga chamaepitys*), field gromwell (*Buglossoides arvensis*), downy safflower (*Carthamus lanatus*), lambsquarters (*Chenopodium album*), sun spurge (*Euphorbia helioscopia*), common fumitory (*Fumaria officinalis*), goosegrass (*Galium aparine*), false cleavers (*Galium spurium*), blackspot hornpoppy (*Glaucium corniculatum*), European heliotrope (*Heliotropium europaeum*), darnel (*Lolium temulentum*), common knotgrass (*Polygonum aviculare*), yellow mignonette (*Reseda lutea*), dwarf elder (*Sambucus ebulus*), common catchfly (*Silene gallica*), field woundwort (*Stachys arvensis*) and cowherb (*Vaccaria hispanica*). Most of these species are associated with annual crops or nutrient-rich anthropised areas (Jauzein 1995) and are common in the medieval archaeobotanical samples of the western Mediterranean world (e.g. Ros *et al.* 2023). Only two species appear in more than one site: darnel and common knotgrass.

### Discussion

Despite the occasional uneven preservation of the carpological remains and their very low density in some contexts, the identified agricultural spectrum allows us to bring to



light qualitative information that is unprecedented for the Andalusi period in some of these regions (Table 6.2), with 10 cereals, 7 pulses, 26 fruits, 6 oil/fiber plants and about 11 aromatic plants. Due to the preliminary nature of this study and the significant imbalance in data from one region to another, a brief synthesis of the obtained results will now be presented, situating them within the broader context of al-Andalus, focusing firstly on plants from the late antique and early medieval periods, and then on plants that may represent real innovations.

### *New or not: A question of perception*

As a preamble to the discussion, it is essential to first define what can be considered to be 'new'. One of the fundamental points of Watson's thesis is the concept of novelty, and the introduction and spread of new species from the Near East to the Iberian Peninsula during the medieval Muslim expansion. This notion of novelty is tricky, because it is ambiguous, in the sense that plants considered to be new for this period are not necessarily considered as such by medieval populations, but rather by historians who have

Table 6.2. Presence/absence per great zone of the main cultivated/used plant taxa in al-Andalus. NW = north of Portugal and Galicia; N = Asturias; NE = Aragón, Catalonia; W = central Portugal; C = Guadalajara, Cuenca, Madrid, Toledo, Extremadura; E = Valencia, Alicante, Murcia, Castello; SW = southern Portugal; S = Cádiz, Málaga, Granada, Jaén, Córdoba. Compilation established after Peña-Chocarro et al. 2019; Ros et al. 2019; Peña-Chocarro and Jorda 2023; Peña-Chocarro et al. 2024; Ros unpublished, pers. comm.

|                                           | NW | N | NE | W | C | E | SW | S |
|-------------------------------------------|----|---|----|---|---|---|----|---|
| <b>Cereals</b>                            |    |   |    |   |   |   |    |   |
| <i>Avena</i> sp.                          |    |   | X  |   | X |   |    | X |
| <i>Hordeum vulgare</i> sp. <i>vulgare</i> |    |   | X  | X | X | X |    | X |
| <i>Oryza sativa</i>                       |    |   |    |   |   | X |    |   |
| <i>Panicum miliaceum</i>                  |    |   |    | X | X |   |    | X |
| <i>Pennisetum glaucum</i>                 |    |   |    |   |   | X |    | X |
| <i>Secale cereale</i>                     |    |   | X  | X | X |   | X  |   |
| <i>Setaria italica</i>                    |    |   | X  |   |   |   |    |   |
| <i>Sorghum bicolor</i>                    |    |   |    |   |   | X |    | X |
| <i>T. aestivum/durum</i>                  |    |   | X  | X | X | X | X  | X |
| <i>Triticum dicoccum</i>                  |    |   | X  |   |   |   |    | X |
| <i>Triticum monococcum</i>                |    |   |    |   |   |   |    | X |
| <b>Legumes</b>                            |    |   |    |   |   |   |    |   |
| <i>Cicer arietinum</i>                    |    |   |    |   | X |   |    |   |
| <i>Lathyrus sativus/cicera</i>            |    |   |    |   | X |   | X  | X |
| <i>Lens culinaris</i>                     |    |   | X  |   |   |   |    | X |
| <i>Pisum sativum</i>                      |    |   |    |   | X |   | X  | X |
| <i>Vicia ervilia</i>                      |    |   |    |   |   |   |    | X |
| <i>Vicia faba</i>                         |    |   |    |   |   |   |    | X |
| <i>Vicia sativa</i>                       |    |   |    |   |   |   |    | X |
| <b>Cultivated/gathered fruits</b>         |    |   |    |   |   |   |    |   |
| <i>Castanea sativa</i>                    |    |   |    |   | X |   |    |   |
| <i>Celtis australis</i>                   |    |   |    |   | X |   |    |   |
| <i>Citrus</i> spp.                        |    |   |    |   |   |   | X  |   |
| <i>Corema album</i>                       |    |   |    | X |   |   |    |   |
| <i>Cornus mas</i>                         |    |   |    |   | X |   |    |   |
| <i>Corylus avellana</i>                   |    |   |    |   | X |   |    |   |
| <i>Cucumis melo/sativus</i>               |    |   | X  | X | X |   |    |   |

(Continued)

Table 6.2. Presence/absence per great zone of the main cultivated/used plant taxa in al-Andalus. NW = north of Portugal and Galicia; N = Asturias; NE = Aragón, Catalonia; W = central Portugal; C = Guadalajara, Cuenca, Madrid, Toledo, Extremadura; E = Valencia, Alicante, Murcia, Castello; SW = southern Portugal; S = Cádiz, Málaga, Granada, Jaén, Córdoba. Compilation established after Peña-Chocarro et al. 2019; Ros et al. 2019; Peña-Chocarro and Jorda 2023; Peña-Chocarro et al. 2024; Ros unpublished (Continued)

|                                      | NW | N | NE | W | C | E | SW | S |
|--------------------------------------|----|---|----|---|---|---|----|---|
| <i>Cydonia oblonga</i>               |    |   |    |   |   |   |    | X |
| <i>Ficus carica</i>                  |    | X | X  | X | X |   | X  | X |
| <i>Fragaria vesca</i>                |    |   |    | X | X |   |    |   |
| <i>Juglans regia</i>                 |    |   | X  |   |   |   |    |   |
| <i>Malus domestica</i>               |    |   | X  |   |   |   |    |   |
| <i>Mespilus germanica</i>            | X  |   |    |   |   |   |    | X |
| <i>Morus nigra</i>                   |    |   |    | X | X |   |    |   |
| <i>Olea europaea</i>                 |    | X | X  |   | X |   |    | X |
| <i>Pinus pinea</i>                   |    |   | X  | X |   | X |    | X |
| <i>Prunus armeniaca</i>              |    | X |    |   |   |   | X  |   |
| <i>Prunus avium/cerasus</i>          |    | X |    |   | X |   |    |   |
| <i>Prunus domestica</i>              |    | X |    | X | X |   |    |   |
| <i>Prunus dulcis</i>                 |    | X | X  |   | X |   |    | X |
| <i>Prunus persica</i>                |    | X | X  |   | X |   |    |   |
| <i>Punica granatum</i>               |    |   | X  |   | X |   |    | X |
| <i>Quercus</i> sp.                   |    |   |    | X | X |   | X  |   |
| <i>Rubus fruticosus</i>              |    |   |    |   | X |   |    | X |
| <i>Rubus idaeus</i>                  |    |   |    | X |   |   |    |   |
| <i>Vitis vinifera</i>                |    | X | X  | X | X |   | X  | X |
| <b>Oil/ fibre plants</b>             |    |   |    |   |   |   |    |   |
| <i>Brassica nigra</i>                |    |   |    | X |   |   |    |   |
| <i>Camelina sativa</i>               |    |   | X  |   |   |   |    |   |
| <i>Cannabis sativa</i>               |    |   |    |   | X | X |    |   |
| <i>Linum usitatissimum/Linum</i> sp. |    |   | X  | X | X |   | X  | X |
| <i>Papaver somniferum</i>            |    |   |    |   | X |   |    |   |
| <i>Stipa tenacissima</i>             |    |   |    |   |   | X |    |   |
| <b>Aromatic plants</b>               |    |   |    |   |   |   |    |   |
| <i>Apium graveolens</i>              |    |   | X  | X |   |   |    |   |
| <i>Coriandrum sativum</i>            |    |   |    | X | X |   |    | X |
| <i>Daucus carota</i>                 |    |   |    |   |   |   |    | X |
| <i>Foeniculum vulgare</i>            |    |   | X  | X |   |   | X  |   |
| <i>Lavandula</i> sp.                 |    |   |    | X |   |   |    |   |
| <i>Lepidium sativum</i>              |    |   |    |   | X |   |    |   |
| <i>Mentha</i> sp.                    |    |   |    | X |   |   |    |   |
| <i>Nigella</i> sp.                   |    |   | X  |   |   |   |    |   |
| <i>Origanum</i> cf. <i>majorana</i>  |    |   | X  |   |   |   |    |   |
| <i>Rosmarinus officinalis</i>        |    |   | X  | X |   |   |    |   |
| <i>Trigonella foenum-graecum</i>     |    |   |    |   | X |   |    |   |
| <i>Verbena officinalis</i>           |    |   | X  |   |   |   |    |   |

worked on medieval sources, for lack of a diachronic or interdisciplinary vision. Also, the uses and knowledge of a plant over time and space fluctuate according to dietary habits, trade flows and population movements. A plant may therefore be rediscovered and perceived as new when it is reintroduced into the food circuit at a particular time. Its history and status must therefore be studied over the long term, by cross-referencing different sources, in an attempt to understand the influences that may have governed its adoption or decline in the uses and values of a society or social group (e.g. Bakels and Jacomet 2003; Ruas *et al.* 2015).

A recent compilation of crops grown in al-Andalus, based on textual sources, lists 47 plants considered as introduced or spread by the Arabs and Berbers (Albertini 2013). But a re-reading of this list in the light of ancient sources or archaeobotanical discoveries shows us that several of these plants were already known and even cultivated by the people of the western Mediterranean. For example, to consider durum wheat (*Triticum durum*), lemon (*Citrus limon*) or watermelon (*Citrullus vulgaris*) as absolute novelties is problematic, as these plants have been discovered in various ancient (i.e. Roman period and late antique) archaeological sites in Europe (Bouby and Marinval 2000; Livarda 2011; Pagnoux *et al.* 2013). For this reason, in the discussion we have made a distinction between what can be called 'heritage', in the sense that the plants were already known in the Iberian Peninsula in earlier periods, and what is new, in the sense of plants of which there is no ancient or early medieval mention in the western Mediterranean or in the Peninsula.

### ***The weight of ancient and early medieval heritage***

In this section, we focus on plants found in the medieval Iberian Peninsula whose consumption and cultivation have already been documented, notably through archaeobotanical approaches (Peña-Chocarro *et al.* 2019; Ros *et al.* 2019; Peña-Chocarro and Pérez-Jorda 2023; Peña-Chocarro *et al.* 2024). The discussion will focus on the main agri-food categories: cereals, pulses, cultivated/gathered fruit, fiber/oleaginous plants and aromatic plants (Table 6.2).

#### ***Cereals***

Although the data are still scarce, it is possible to already establish that, in most regions, the local agricultural system was based on cereal diversity, with their specific importance varying from region to region. Archaeobotany reveals the presence of naked wheats (*Triticum aestivum*, *T. durum*), hulled and naked barley (*Hordeum vulgare* sbsp. *vulgare* and var. *nudum*), hulled wheats (*Triticum dicoccum*, *T. monococcum*, *T. spelta*), millets (*Panicum miliaceum*, *Setaria italica*), rye (*Secale cereale*), and oat (*Avena* sp.), although its cultivated or wild status is impossible to confirm when only seeds are found.

Naked wheats and hulled barley played an essential role in agriculture throughout the medieval Peninsula, as was the case in previous periods. Although their diversity cannot yet be accurately characterised and quantified, both bread wheat and durum wheat have been recorded. Naked barley is also recorded at Christian sites in the north of the Peninsula, but no evidence of its cultivation has been found.

Regarding hulled wheats, our study provides no new information on the consumption or cultivation of spelt, which only appears in the north-west of the Peninsula, while emmer is attested in both Christian and Muslim contexts, reaching modest proportions in the latter (< 10%). In the case of einkorn, its presence as a secondary crop was already observed both in the Christian areas of the north of the country (Basque country, Catalonia), and in the Muslim areas of Andalusia (Córdoba, Málaga). Within the Málaga region, our data reveal a particularly noteworthy presence of einkorn at the Cártama site, outnumbering other cereals. This particular abundance is unusual and it is not possible to determine whether this is related to this site in particular, the excavated context having yielded remains interpreted as manure (Banerjee unpublished), or to a particular agricultural tradition in the region. In Morocco, the role of einkorn in specific activities, such as in animal feed, is well documented (Peña-Chocarro *et al.* 2009).

Before the Middle Ages, at least two species of millet were cultivated in the Peninsula: proso millet and foxtail millet. Archaeobotanical records of foxtail millet are extremely rare in Iberia, and our approach does not permit any further discussion relating to this crop, which seems to have been very marginal. Proso millet is a better-known secondary cereal, and its presence in the north and west of the Peninsula is well attested, in both Christian and Muslim contexts, sometimes in significant quantities. Our study also shows the presence of proso millet in Muslim contexts in the Guadalajara area, as well as in Extremadura and in the Málaga region.

In the Iberian Peninsula, rye appears between the 3rd century and the first half of the 1st century BC, probably acting as a weed (Seabra *et al.* 2023). The cereal appears to have spread slowly, and in the Middle Ages it is mainly found in the north, west and centre of the Peninsula, in both Christian and Muslim contexts. Our data complements pre-existing data, revealing its discreet presence in several Muslim sites in Guadalajara, as well as in Aragón and Extremadura, where its frequency makes it the third most common cereal after naked wheat and hulled barley (Ros *et al.* 2019). At Albalat in Extremadura, the discovery of grains as well as numerous rachis and straw fragments suggests that it was frequently used as animal feed or bedding.

#### ***Pulses***

It is very difficult to trace a solid history of legume consumption and cultivation in the Peninsula, due to the



paucity of discoveries. In general, legumes only appear occasionally on sites, sometimes in exceptional quantities. This situation is not unique to this geographical area, as similar observations have been made for medieval France (Ruas 2010) and Morocco (Ros *et al.* 2024). For this reason, we consider that it is still too early to interpret their discovery in one region or another as revealing a local agricultural specificity.

In medieval Iberia, the legumes range of species is limited: chickpea (*Cicer arietinum*), red/grass pea (*Lathyrus sativus/cicera*), lentil (*Lens culinaris*), pea (*Pisum sativum*), bitter vetch (*Vicia ervilia*), broad bean (*Vicia faba* var. *minor*) and common vetch (*Vicia sativa*). Among the legumes absent so far from al-Andalus' archaeobotanical register are the big-seeded varieties of broad bean (e.g. *Vicia faba* var. *equina* and var. *major*), which have been reported in Byzantine Sicily (Fiorentino *et al.* 2024) and at Rirha, a late medieval rural settlement in northern Morocco (Ruas 2018), as well as lupin (*Lupinus* sp.) and cowpea (*Vigna unguiculata*).

#### *Cultivated/picked fruit*

During the Middle Ages, whether in Christian or Muslim contexts, certain fruit taxa remained a staple, notably the vine (*Vitis vinifera*), olive (*Olea europaea*), fig (*Ficus carica*) and pomegranate (*Punica granatum*), which, even when not grown locally, could be transported in fresh or dried form, sometimes beyond the Pyrenees and in other parts of the Mediterranean (Ferrer 2012; Ros *et al.* 2016). Other species consumed in the Peninsula since at least the Roman and early medieval period include melon/cucumber (*Cucumis melo/ sativus*), walnut (*Juglans regia*), apple (*Malus domestica*), pear (*Pyrus communis*), black mulberry (*Morus nigra*), cherries (*Prunus avium*, *P. cerasus*), plum (*Prunus domestica*), almond (*Prunus dulcis*), date palm (*Phoenix dactylifera*) and peach (*Prunus persica*). Previous synthetic studies demonstrated a certain imbalance in the data, with most of these taxa absent in the south (Peña-Chocarro *et al.* 2019). Our study somewhat counterbalances these results, with fig, olive, umbrella pine, plum, almond, pomegranate and grapevine being recorded in the Málaga region. In addition to these results, at Albalat in Extremadura, species were identified for the first time in the archaeobotanical register of al-Andalus, namely chestnut (*Castanea sativa*), cornel (*Cornus mas*), hazelnut (*Corylus avellana*) and European nettle tree (*Celtis australis*). In our view, these fruit taxa discovered at Albalat do not represent real novelties, as most of them may be present in the wild in the Peninsula, or have already been identified by charcoal fragments in other archaeological sites; these are only their first carpological discoveries, as some of these remains are sometimes poorly preserved in carbonised assemblages.

#### *Condiments, vegetables, aromatic and fibre plants*

This category is extremely difficult to identify through archaeobotany because of the nature of the seeds, rich in oil or fragile, and of the most common method of preservation, carbonisation, which tends to deform these remains, making them difficult to identify, or even destroying them. For this reason, as for the pulses, we will not make spatial comparisons for these taxa.

In the Peninsula, species that were identified in Andalusi contexts are: mustards (*Brassica nigra*), cabbage (*Brassica oleracea*), gold-of-pleasure (*Camelina sativa*), hemp (*Cannabis sativa*), flax (*Linum usitatissimum*), esparto (*Stipa tenacissima*), celery (*Apium graveolens*), coriander (*Coriandrum sativum*), carrot (*Daucus carota*), fennel (*Foeniculum vulgare*), lavender (*Lavandula* sp.), mint (*Mentha* sp.), vervain (*Verbena officinalis*), rosemary (*Salvia rosmarinus*) and thyme (*Thymus* sp.) So far, opium poppy (*Papaver somniferum*) was only found in Christian contexts, and marjoram (*Origanum* cf. *majorana*) and *Nigella* sp. only in Islamic contexts (Ros *et al.* 2019).

#### *Same plants, different practices? The curious case of darnel*

Recent archaeobotanical research also revealed different uses for certain plants that are otherwise known in the Peninsula, suggesting a potential change in status. At Albalat (10th–12th century, Extremadura), a significant concentration of seeds was detected in a small rubbish dump, on the track that runs along the inner side of the fortified wall of the medieval city. The archaeobotanical sample yielded 2,586 carpological remains, with a peculiar diversity, mainly composed of darnel grains, accompanied by cereal grains (naked wheat, hulled barley, oats, rye), some rachis fragments (naked wheat, rye), some fruits (grape seeds, acorns, fragments of almond stones), flax seeds, peas, fenugreek, coriander and a few weeds (common corn-cockle, grasses) (Ros *et al.* 2019). The percentage of darnel (79% of the total remains) is completely unprecedented. Although frequently found in carpological samples from medieval western Europe, it is generally not very abundant and rarely reaches high proportions. At Albalat, our first hypothesis was that it could be a by-product of the processing of cereal crops, since after threshing undesirable elements such as straw fragments and weed seeds are removed by sieving (Hillman 1984). However, the sample contains few straw elements and few weed seeds, whose diversity is limited – six taxa. And in addition to the darnel and cereals grains, we noted seeds of other food or aromatic plants, such as flax, peas, coriander or fenugreek, raising the status of the sample, as food waste.

Although darnel has a poor reputation in terms of human consumption, there is evidence of its use as food in northern Africa. In the 20th century, the Tuaregs left it to ripen in the

barley fields, harvested it and made flour from it, reserved for guests and children (Comet 1992, 290). In the Middle Ages, textual sources do not mention it among the food or cultivated plants in al-Andalus, while in France, written sources mention its cultivation; its flour, mixed with barley flour, made it possible to suppress its harmful character and obtain good bread (Comet 1992, 259). The whole plant was also used as green fodder and its grains, like those of cereals, were fed to farmyard animals (Comet 1992, 290). At Albalat, we find it difficult to favour one hypothesis over another, as other plants in the sample, such as fenugreek, are mentioned in Arabo-Andalusian textual sources as both food and fodder plants (Albertini 2013). However, this discovery is interesting in that it bears witness to a new practice whose origins have yet to be defined. Is it a practice that originated in North Africa, which could have been passed on and occasionally developed in the Andalusian countryside? Was it a practice from the Christian world, which the Albalat people, living in a frontier zone, would have taken over and adapted locally? Or simply chance, as the plant was particularly available at the time or other basic resources not sufficiently abundant?

### *A revolution? In search of novelty*

Archaeobotanical data highlights the appearance of new taxa in the Peninsula from the 11th–12th centuries. These taxa correspond either to new introductions to the region, or even to Europe, or to plants that have been known since at least Antiquity, but which appear to have developed recently, probably as a result of agricultural practices that have encouraged their local acclimatisation. These new taxa belong to different food/agricultural groups: cereals, fruit trees, aromatic plants and textile plants.

Among the introductions, pearl millet (*Pennisetum glaucum*) was recorded, which today is considered an important staple crop in the semiarid regions of Asia and Africa, due to its high nutritive value and adaptation to varying stress conditions. In ancient times, its presence was recognised by archaeobotany in western sub-Saharan Africa between the 4th and 3rd millennia BC, but little is known about its spread to the north of the continent and Europe, and its identification in medieval texts remains ambiguous; one hypothesis put forward to date is that the word *dacsa* could refer to this cereal (Peña-Chocarro and Pérez-Jorda 2023). In our corpus, pearl millet appears in two sites of the Málaga region (Cártama, Moraleda, 12th–14th centuries), albeit only represented by a few grains. At Cártama, the agricultural nature of the sampled context suggests that this is indeed a local crop, but it remains difficult to assess its role in agricultural systems and the local economy. The plant has also been found in the Cordoba province, in the Valencia region (Peña-Chocarro and Pérez-Jorda 2023; Peña-Chocarro *et al.* 2024), as well as in Morocco, although this discovery is still unpublished and cannot be compared in depth at present.

Recent archaeobotanical studies, both in Spain and Portugal, have revealed other 'novelties', including rice (*Oryza sativa*), sorghum (*Sorghum* sp.), several fruit trees such as apricot (*Prunus armeniaca*), citrus fruits (*Citrus* spp.), medlar (*Mespilus germanica*) and quince (*Cydonia oblonga*), as well as hemp (*Cannabis sativa*), fenugreek (*Trigonella foenum-graecum*) and garden cress (*Lepidium sativum*) (Ros *et al.* 2019; Peña-Chocarro and Pérez-Jorda 2023; Ros *et al.* 2024). Sometimes regarded as novelties linked to the medieval Muslim expansion, these species are in fact rediscovered or cultivated for the first time in the Peninsula, since they have all been identified by archaeobotany in the Mediterranean or Europe, in Roman or early medieval contexts (Bouby 2014; Ruas *et al.* 2015). It should be noted that, in the Peninsula, these new archaeobotanical findings, observed from the 11th–12th centuries, seem to be more related to coastal and urban areas in the south, such as Valencia, Murcia, Granada, Málaga, Cadiz, southern Portugal and, more exceptionally, Extremadura.

### **Overall reflection and outlook: Heartlands and frontiers**

Archaeobotany reveals a common agricultural base throughout the Andalusian Peninsula, which seems to have changed little since Antiquity and the first centuries of the Middle Ages. The agricultural systems are generally based on the staple species of the Mediterranean, namely naked wheat, hulled barley, vines, olives and figs, and this tradition did not really evolve during the Almoravid, Almohad and later periods. However, although the agricultural base does not evolve, it does not mean that the practices associated with the cultivation and maintenance of plants did not change. In fact, carpological data alone does not allow us to observe any changes in irrigation or fertiliser practices. With regard to these aspects, only an interdisciplinary approach, which would include carpological, isotopic (e.g. Ros *et al.* 2024), autecological (e.g. Stroud *et al.* 2024), and even quantitative eco-anatomical analyses (on fruit trees charcoal fragments) (e.g. Terral and Durand 2006), would provide an in-depth view of the agricultural practices of this period. Such analyses are planned as part of ongoing projects,<sup>3</sup> and the next few years should see the publication of the first results. Another area of research that will require particular attention is that of intraspecific diversity. While carpology can be used to document the specific diversity of the agricultural spectrum exploited in a given region at a given time, it is rarely used to address the question of the old varieties exploited, and therefore to determine whether, within the same species, a population has encouraged the development of one or more particular varieties to meet different needs, whether food or economic. Research is currently being carried out using geometric morphometry on grapevines and olive trees (Terral *et al.* 2004, 2010), to determine whether the

same varieties were used in Muslim and Christian Iberia, and whether any changes have been detected over time, possibly corresponding to the introduction and spread of new varieties of Near Eastern or North African origin. This work, which is progressing, will also make it possible to compare different areas within the same polity, for example the Almoravid empire, and to highlight any varietal and agricultural homogeneity on either side of the territory.

Regarding the differences in agricultural production between regions that were highlighted in previous syntheses, our data allowed the study of new geographical areas that have been little explored, such as Guadalajara and Málaga. In Guadalajara, the local populations used a diversity similar to that used in Aragón or Catalonia during the same period, with an agricultural base supplemented by rye and proso millet, while the Málaga sites show a diversity more similar to that identified in other areas of Andalusia or the Islamic Levante, notably through the presence of new taxa such as pearl millet. These regional differences may be due to a number of factors, both environmental (climate, soil type, agronomic potential of soils) and socio-cultural (political and economic context, role of border areas). However, the data is still too disparate to draw any definitive conclusions, with many regions being studied on the basis of fewer than a dozen archaeological sites. Only a substantial increase in the archaeobotanical corpus will make it possible to clearly visualise the differences between regions and to formulate reliable hypotheses as to the factors involved.

Regarding the rise of new taxa observed by archaeobotany, it seems to be linked to a certain chronology (11th–12th centuries) and to be more marked in Andalusia (Cadiz, Granada, Málaga), in the Levante (Murcia, Valencia) and in urban or semi-urban contexts benefiting from a certain status (e.g. Albalat in Extremadura) (Fig. 6.4). This period largely corresponds to the rise and expansion of the Almoravids, a Sanhajian Berber dynasty that formed an empire encompassing Morocco, the Western Sahara, Mauritania, part of modern Mali and western Algeria, as well as the south of the Iberian Peninsula. The integration of the south of the Peninsula into this empire may have played a role in the spread and introduction of certain taxa, particularly cereals such as pearl millet and sorghum (Peña-Chocarro *et al.* 2024). Indeed, the empire included part of present-day Mauritania and Mali, where archaeobotanical discoveries reveal their cultivation by local populations at that time (Nixon *et al.* 2011; Champion *et al.* 2021). We can therefore imagine that, under the impetus of the empire, trade networks saw the circulation of economic plants from sub-Saharan Africa to Morocco and al-Andalus, such as the cereals mentioned above, but also other taxa such as rice (*Oryza* sp.) and cotton (*Gossypium* sp.), the latter having been identified in an 8th- to 11th-century context at Volubilis, in Morocco (Fuller and Pelling 2018). The role of the Almoravids in the spread and development of these taxa in the Iberian

Peninsula would also explain why they have not been identified further north, for example in Catalonia or Aragón, as these areas had already come under Christian rule by this period. These hypotheses need to be confirmed by greater archaeobotanical investment, ideally by strengthening the pre-Almoravid, Almoravid and later contexts.

The current state of data does not permit a detailed comparison across multiple regions in Iberia which can be defined as frontiers for lengthy periods of time. Nonetheless, it can be suggested that the common agricultural base across al-Andalus did not vary between political heartlands and frontiers, at least not in terms of species representation. It is also possible to tentatively suggest that the majority of so-called ‘novelty’ species can be associated with Andalusian political heartlands, namely the southern and south-eastern parts of al-Andalus. However, the data is of a relatively coarse resolution, deriving as it does from very particular and disparate points of occupation. There may have been differences in the range of species cultivated between urban estates and rural holdings, between localities across regions that were both heartland and frontiers, not to mention the mobility of produce through local and regional trade, and future discoveries will add to the complexity of this picture. However, the archaeobotanical data can provide important complementary information to the reconstruction of land use in territories that were designated as frontiers for defined periods of time. In the case of Guadalajara, the same diversity of crops as found in neighbouring Aragón or Catalonia and the adoption of darnel at Albalat may both reflect the nature of cross-cultural contacts across the frontier, and/or the endurance of earlier agricultural practices. In contrast, the Málaga region, a long-term Andalusian heartland, is comparable to other parts of Andalusia and the Levante, particularly with the presence of pearl millet. Recent scholarship has affirmed that migrating Berber peasants were key drivers of agricultural change on the ground, and they are associated with the irrigated cultivated spaces that defined large swathes of the cultural landscape in rural al-Andalus. This is as evident in frontier regions such as the northern parts of Guadalajara, as it is in the southern heartlands.

The archaeobotanical approach offers here a different perspective, one that complements that formulated on the basis of the study of textual sources, in particular by highlighting taxa that are sometimes difficult to identify in textual archives and providing them with a highly specific spatial context. Without a strong economic or symbolic role, cultivated and gathered species are sometimes overlooked by medieval authors, giving full meaning to our approach based on material remains, which are subject to other biases, such as taphonomy. The challenge we now face is to multiply our studies until we have better geographical and chronological coverage of the Peninsula, enabling us to obtain a global and up-to-date understanding of medieval agriculture and its dynamics over the long term.



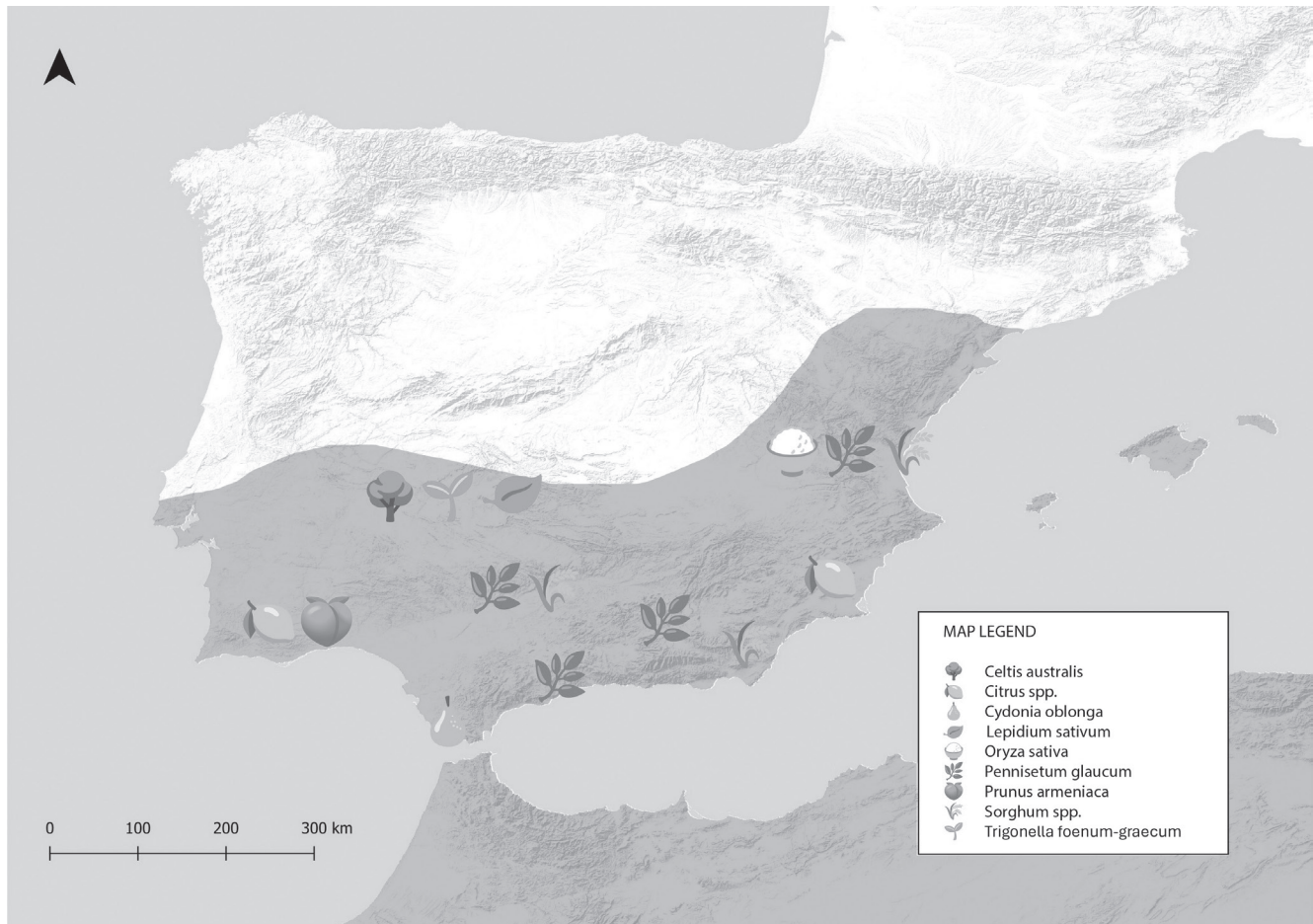


Fig. 6.4. New/Exotic cultivated/gathered plants identified by carpological remains in al-Andalus (compilation established after Peña-Chocarro et al. 2019; Ros et al. 2019; Peña-Chocarro and Jorda 2023; Peña-Chocarro et al. 2024; Ros unpublished, pers. comm.). The grey area indicates the approximate extent of Almoravid territory in the 12th century

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## Notes

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- 2 Larrieu M. ongoing: Fruit Trees and Wooded Landscapes in al-Andalus (Medieval Muslim Spain): An Archaeobiological and Biogeographical Approach, University of Montpellier, under the supervision of J. Ros (CNRS, ISEM, director), S. Gilotte (CNRS, Ciham, co-supervisor), C. Vaschalde (Mosaïques Archéologie, LA3M, co-supervisor).
- 3 ERC project MedGreenRev; ANR project ISEMA.

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# The zooarchaeology of frontier societies in late medieval Iberia

*Marcos García García*

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[...] To live in the Borderlands means to  
put *chile* in the borscht,  
eat whole wheat tortillas,  
speak Tex-Mex with a Brooklyn accent;  
be stopped by *la migra* at the border checkpoints [...].  
In the Borderlands  
you are the battleground.

Gloria Anzaldúa, 'To live in the borderlands means you'  
(1987, 194–195)

## Introduction

This fragment of Gloria Anzaldúa's poem illustrates the complex, fluid, permeable and, at times, violent life of the frontier. Drawing from her own experience, this Chicano poet reflects the mix of cooking traditions, the combination of linguistic styles and the repression factor introduced by the *migra* (i.e. U.S. Immigration and Customs Enforcement) in the lives of Spanish-speaking migrants, while emphasising the embodiment of human experience at the frontier. As rightly noted by Margarita Birriel (2019, 167), frontier settings foster the emergence of frontier subjects, characters constantly negotiating the path to survival while existing *in-between*.

The concept of frontier applied to historical analysis is not an easy one, but also a potentially very profitable one. On the one hand, we risk reducing historical dynamics – always complex and polyhedral – to the simple dichotomy or confrontation between two or more supposedly homogenous realities. On the other hand, employing the concept of frontier enables the formulation of research questions that centre on the conflicted relationships between various human groups. In this regard, it must be emphasised that conflict does not necessarily crystallise in disruptive or dysfunctional events, much less in violence or war, as commonly believed. Much to the contrary, conflict is inherent to humanity, the result of everyday interaction and the clash of the often-incompatible interests of the various agents and structures involved. This

leads us to two important observations: first, conflict does not invariably result in phenomena that can be categorised as essentially good or bad; and second, throughout history, conflict has been mostly solved by peaceful means, rather than by violence (Kropotkin 1989 [1902]; Molina and Muñoz 2004; Graeber and Wengrow 2021). Frontier situations, in short, hold special interest for the study of conflict understood as a defining feature of human nature.

Medieval Iberia, especially during the central and late Middle Ages (c. 1000–1500), is an extraordinary observatory to study these matters. Historical dynamics during this period were characterised by the multiplication, quantitative and conceptual, of frontiers. These were a consequence of demographic, social and religious changes undergone by Iberian populations, resulting from migrations (forced or voluntary), conquests, (re)conquests, colonisation, hybridisation and transculturation (Glick and Pi-Sunyer 1969; Bartlett 2003 [1993]; Pluskowski *et al.* 2011; Torró 2019). The to-and-fro shift of political boundaries caused, among other things, the formation of complex multicultural and changing landscapes, ridden by various forms of tension and conflict, which affected, in different but invariably relevant ways, the everyday life of the social actors that inhabited them. For this reason, even if historical and archaeological research no longer sees the frontier as a barrier or limit between political entities, but rather as a mechanism of social interaction and economic, social, cultural, religious and artistic exchange (Rodríguez 2005), we cannot pretend that the phenomena of conquest and colonisation that defined the dynamic medieval frontier were exempt from violent practices and forms of domination (Torró 2001). In this regard, livestock-keeping was one of the main predatory activities, serving both as a spearhead and a foundation for processes of feudal expansion, conquest, and colonisation (Mínguez 1982; Torró 2019).

Although the study of medieval frontier(s) and, particularly, the role played by herding during the period under consideration has been approached from several angles (e.g.

García de Cortázar and Peña 1987; Pascua 2012; Ortega 2023), this work focuses, within the context of the Landscapes of (Re)Conquest project (LoR), on human-animal interaction in several frontier regions in the Iberian Peninsula through zooarchaeological analysis. The chapter aims to undertake low-resolution comparative analysis of archaeofaunal remains from several archaeological sites to present a first general overview of production, distribution, processing and consumption of animal resources in several frontier regions during the Middle Ages.

## Materials and methods

### Materials

The zooarchaeological dimension of the Landscapes of (Re)Conquest project involved the study of eight archaeofaunal assemblages from several regions in the Iberian Peninsula that, at some point or other during the Middle Ages, were situated on the frontier (Fig. 7.1). As such, the empirical base for this study is markedly heterogeneous in terms of provenance, chronology, nature, and cultural context (Table 7.1). This diversity in the assemblages forces us to keep all conclusions tentative, but at the same time, it allows for multi-scale, multi-parameter comparative analysis. The assemblages analysed here were recovered at these sites:

**Pla d'Almatà (PA)** (Balaguer, Lleida). Urban Andalusi site that yielded a large volume of archaeofaunal material, largely from negative structures, such as silos and cesspits, dated to the 11th century (Alòs *et al.* 2006–2007; Monjo *et al.* 2009; Camats *et al.* 2015).

**San Esteban (SE)** (Murcia). Andalusi *arrabal* (suburb) outside the city walls, occupied in the 12th and 13th centuries. The material comes from several spaces within a densely populated area (Eiroa *et al.* 2019a, 2019b).

**Castil de los Judíos (CJ)** (Molina de Aragón, Guadalajara). Settlement at the foot of the castle of Molina de Aragón. Three assemblages were studied: CJ-1) domestic waste found in two silos dated to the Andalusi period (10th–11th centuries); CJ-2) domestic waste left by the Jewish community that occupied the site in the 12th–13th centuries; CJ-3) remains from a large open-air rubbish dump that formed after the abandonment of the Jewish quarter in the 14th–15th centuries (Arenas 2017).

**Castle of Molina (MOL)** (Molina de Aragón, Guadalajara). Project LoR undertook several excavation campaigns in the castle, and many animal remains were found, probably associated with the temporary occupation of the castle by a military garrison in the 12th–13th centuries (this volume).

**Alcázar Real de Guadalajara (ALC)** (Guadalajara).

A royal palace during the Late Middle Ages, and, therefore, related to the Castilian court and social elite. The assemblage was found in a dump found in the area of the latrines and is dated between the mid 13th–14th centuries (Crespo and Cuadrado 2002).

**Castle of Lorca (LOR)** (Lorca, Murcia). The castle was the seat of the Jewish community of Lorca. Several excavation campaigns have yielded a significant quantity of animal remains consisting of food waste dated to the 14th–15th centuries (Eiroa 2012, 2023).

Therefore, the selected samples were recovered from contexts representing a wide range of chronological periods and geographies, as well as being related to social groups with different socio-economic characteristics and ethno-religious affiliations, including Muslims, Christians and Jews. For this reason, this work will only describe and compare them in very broad terms, using some of the main zooarchaeological parameters, leaving a more detailed and nuanced perspective of each assemblage for future works.

### Methods of zooarchaeological analysis

The methodological protocols and the quantification techniques used are explained in detail in García (2019), but can be summarised as follows:

**Excavation.** Although in some of the case studies (PA, SE, MOL and LOR) specific methods to recover organic samples were used (dry and wet sieve), the samples examined here include only those hand collected. While this may influence the composition of the assemblage (Payne 1972, 1975; Clason and Prummel 1977), it is unlikely to have significantly impacted the results presented here.

**Identification.** Where possible, all the remains were identified anatomically and taxonomically with the aid of the author's own reference collection. The greatest challenge was to distinguish between sheep (*Ovis aries*) and goat (*Capra hircus*), for which Boessneck's (1969) and Zeder and Lapham's (2010), among other criteria, were used.

**Recording.** All remains were divided into two main groups: identified remains (NISP) and non-identified remains. The first category includes remains that can be regarded as accountable based on an adaptation of Davis' (1992) protocols, which was the main quantitative measure used. Non-identified fragments mostly belong to skull bones, non-identifiable long bones (chiefly the central diaphysis), flat bones such as the scapula (except the glenoid cavity/neck) and the pelvis (except the acetabulum), vertebrae (except the atlas and the axis), ribs and bone splinters.



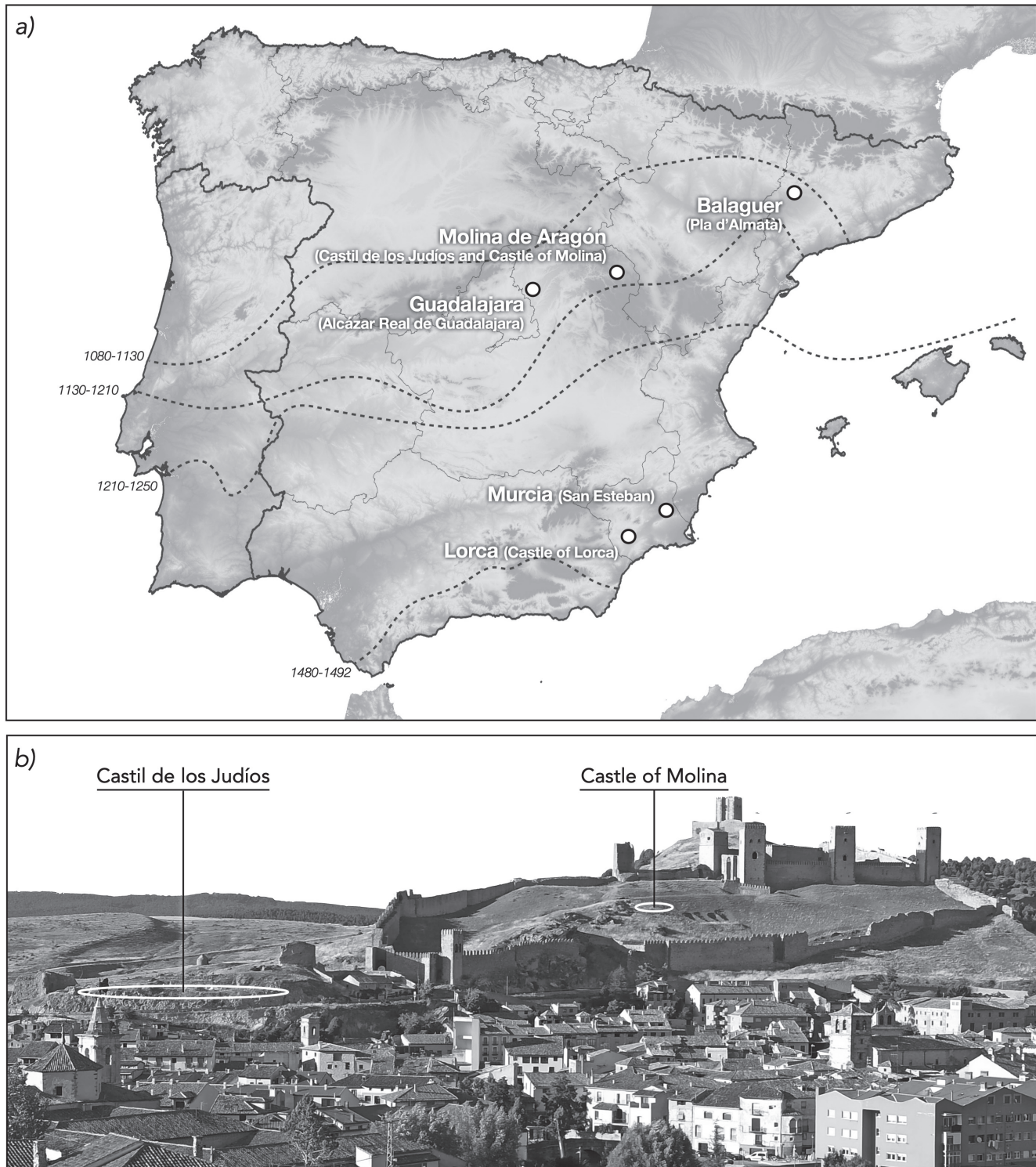


Fig. 7.1. a) Map with the sites in which the archaeofaunal assemblages analysed were found. The lines outline the diachronic evolution of the frontier between the Christian kingdoms and al-Andalus. b) View of Molina de Aragón, with indication of the area excavated within the framework of project Landscapes of (Re)Conquest (Castle of Molina) and the archaeological site of Castil de los Judíos.

Table 7.1. List of sites, location, chronology, cultural context, and type of site in which the archaeofaunal assemblages analysed were found

| Site                               | Location                                           | Chronology<br>(c. AD) | Cultural<br>context | Type of<br>settlement |
|------------------------------------|----------------------------------------------------|-----------------------|---------------------|-----------------------|
| 1. Pla d'Almatà (PA)               | Balaguer (Lleida, Catalonia)                       | 11th C.               | Islamic             | Urban                 |
| 2. San Esteban (SE)                | Murcia (Murcia)                                    | 12th–13th C.          | Islamic             | Urban                 |
| 3.1. Castil de los Judíos-1 (CJ-1) | Molina de Aragón (Guadalajara, Castilla-La Mancha) | 10th–11th C.          | Jewish?             | Urban                 |
| 3.2. Castil de los Judíos-2 (CJ-2) | Molina de Aragón (Guadalajara, Castilla-La Mancha) | 12th–13th C.          | Jewish              | Urban                 |
| 3.3. Castil de los Judíos-3 (CJ-3) | Molina de Aragón (Guadalajara, Castilla-La Mancha) | 14th–15th C.          | Jewish?             | Urban                 |
| 4. Castle of Molina (MOL)          | Molina de Aragón (Guadalajara, Castilla-La Mancha) | 12th–13th C.          | Christian           | Military?             |
| 5. Alcázar de Guadalajara (ALC)    | Guadalajara (Castilla-La Mancha)                   | Mid-13th–14th C.      | Christian           | Elite                 |
| 6. Castle of Lorca (LOR)           | Lorca (Murcia)                                     | 14th–15th C.          | Jewish              | Urban                 |

**Quantification.** The quantitative analysis is largely based on the Number of Identified Specimens (NISP) (accountable remains), which were used as the key variable to quantify the taxonomic composition of the different assemblages, and as the baseline to calculate the remaining analytical parameters.

**Taxonomic representation.** In order to compare the distribution and representation of the selected taxonomic groups (see below), O'Connor's (2001, 56) method, which is based on a natural logarithm that calculates the relative frequency of each species, was used. This was recommended by the disproportionate weight of caprine samples compared to other taxa in all assemblages. For this reason, in order to easily establish possible relative differences in proportions in each assemblage, these were re-scaled, narrowing the difference between the highest and lowest values, which highlights over-represented and under-represented taxa.

**Anatomical representation.** The quantification of bones belonging to different body parts of caprine specimens was carried out following O'Connor (2000, 2003), with the methodological adjustments presented in García (2019), which enabled an arithmetically objective quantification of significantly under- and over-represented body parts. This parameter was based on the comparison of the five anatomical regions into which the animal bodies were divided, each of which was represented by the highest MAU (Minimal Anatomic Units) value for the relevant bones. The anatomical regions used were skull, neck+axial (atlas, axis, other vertebrae), forelimb (scapula, humerus, radius, ulna), hind limb (pelvis, femur, tibia, tarsals) and lower legs+feet (metapodials, phalanges).

**Slaughter age.** The study of the slaughter age was limited to caprine specimens and used two methods. First, through the fusion of long bones: only epiphyses with fully formed spiculae along the surface of the epiphysis were regarded as fused. Four categories were created: 'fused epiphysis', 'epiphysis in the process of fusing', 'non-fused epiphysis' and 'non-fused metaphysis'. These categories were quantified following O'Connor (1989) and Silver (1969). Second, through teeth growth and wear, following Payne (1973, 1987) to characterise the mandibular sequences. Afterwards, the mandibles were assigned to the age groups suggested by Payne (1973) and to the three categories proposed by Greenfield (1988): immature, subadult and adult.

**Carcass processing.** The bones presented abundant butchery marks, which were carefully recorded. All marks identified in post-cranial bones were marked on templates and counted. Their basic features (chop, cut), position on the bone (medial, joint or both), and possible aim (skinning, quartering, filleting and marrow-extraction) were also recorded (Binford 1981).

**Biometric analysis.** Biometric analysis was limited to the morphometric characterisation of sheep post-cranial bones and used the log-ratio technique (Simpson *et al.* 1960; Meadow 1999), with a sample of unimproved Shetland ewes recorded by Davis (1996) as standard. Only fused bones and measurements with less evidence of sexual dimorphism and post-fusion growth were considered (Popkin *et al.* 2012; Aniceti and Albarella 2022). The small body of evidence available for some anatomical planes (< 30 measurements) demanded, against Davis' (1996) advice, considering width and depth

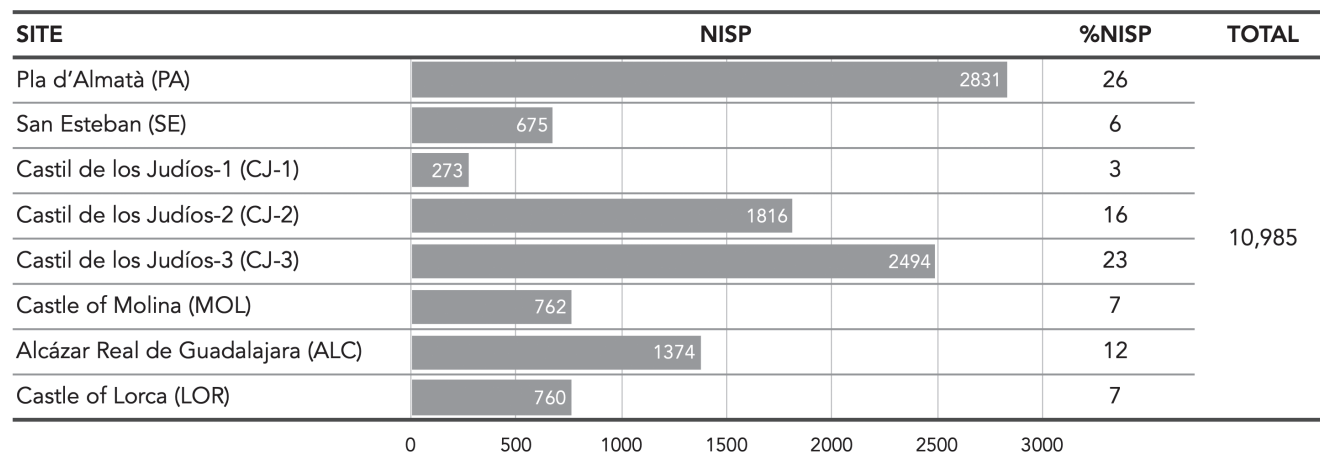


Fig. 7.2. Distribution of identified specimens (NISP) in the assemblages

in combination. The statistical significance of the biometric data drawn from the different sites was calculated using Student's *t*-test and tested at the 95% confidence level ( $p < 0.05$ ).

## Results

All assemblages exhibited a similar level of preservation, characterised by moderate alteration of bone surfaces, low presence of gnawing marks, and few evidence for thermoalterations affecting whole bone specimens. The total number of identified specimens (NISP) was just under 11,000, but the number of specimens yielded by each site varies widely (Fig. 7.2). The largest assemblages came from PA (26% of the total) and CJ-3 (23%), followed by CJ-2 (16%), ALC (12%), MOL (7%), LOR (7%), SE (6%) and CJ-1 (3%). In all sites, the total number of specimens was over 100, so they are regarded as representative for the study of the major parameters under consideration here.

## Taxa frequency

Concerning taxonomic distribution, we shall focus on a selection of species or taxonomic groups that are not only of special interest for the topic at hand but are also particularly suitable for the sort of comparative analysis undertaken here. As such, caprines (sheep *Ovis aries*/goat *Capra hircus*), cattle (*Bos taurus*), suids (*Sus* sp.), leporids (rabbit *Oryctolagus*/hare *Lepus granatensis*), chicken (*Gallus dom.*), goose (*Anser anser*) and wild birds (partridge *Alectoris rufa*, pigeon *Columba* sp. and small Passeriforms species) were regarded as particularly valuable to understand the composition of the faunal samples; the comparison of dietary habits identified with the orthopraxis of the three religious cultures present in medieval Iberia as well as the identification of well-defined dietary habits in specific cultural or socio-economic contexts.

Together, remains assigned to these species account for 98.2% of the total (non-tabulated), so it can be safely assumed that the assemblage is largely constituted by alimentary waste. As illustrated in Table 7.2 and Plate 7.1, the frequency of each taxa varies widely from context to context, and two groups can be easily distinguished.

A first group includes caprines, cattle and chicken, which are widely represented in all assemblages, accounting for between 80% of the total in SE and 95% in CJ-1 (89% of aggregate total). Caprines are by some distance the most abundant group. Although overall sheep are more numerous than goats (in a 1:0.6 proportion), significant differences exist from site to site (Fig. 7.3). Sheep clearly outnumber goats in PA and MOL, and less markedly so in SE and ALC, while in CJ-1, CJ-3 and LOR they are roughly even; in CJ-2 goats are better represented than sheep. Cattle are also abundant in all assemblages, and it should also be noted that they are the largest meat source among all the species considered, owing to their size. The differences between sites are not regarded as sufficiently significant to lead to any conclusions. The same applies to chickens, also abundantly represented in all assemblages and second only to caprine taxa in terms of number of specimens.

More interesting still are a second group of species, whose proportions are very unevenly distributed across the sites under study. Suids are only present (but always below 5% of the total) in the two contexts associated with Christian populations (MOL and ALC) and in the Jewish quarter of Lorca (LOR); and are totally or virtually absent from the remaining contexts. Leporids are only missing from CJ-2, and are fairly well represented in the other sites, especially in PA and SE, where they are the second most abundant group, only behind caprines. In addition, the high presence of goose in CJ-2 is remarkable; the species is present – but in significantly smaller numbers – in CJ-3 and ALC, and is residual or entirely lacking in the rest. Finally, wild birds are



Table 7.2. Number of identified specimens (NISP), percentage of total assemblage (%) and natural logarithms (LN) for the relative abundance of main taxa and taxonomic groups. All 1 NISP values are dummy values introduced, to enable the inclusion in the comparative analysis of taxonomic groups that are totally absent from some of the assemblages

|       |      | Caprines     | Cattle      | Suids       | Leporids    | Chicken      | Goose       | Wild birds  | Total NISP   |
|-------|------|--------------|-------------|-------------|-------------|--------------|-------------|-------------|--------------|
| PA    | NISP | 2205         | 132         | 1           | 296         | 108          | 1           | 10          | <b>2753</b>  |
|       | %    | 80.09        | 4.79        | 0.04        | 10.75       | 3.92         | 0.04        | 0.36        |              |
|       | LN   | 4.38         | 1.57        | -3.32       | 2.38        | 1.37         | -3.32       | -1.01       |              |
| SE    | NISP | 456          | 41          | 4           | 121         | 38           | 1           | 9           | <b>670</b>   |
|       | %    | 68.1         | 6.1         | 0.6         | 18.1        | 5.7          | 0.1         | 1.3         |              |
|       | LN   | 4.2          | 1.8         | -0.5        | 2.9         | 1.7          | -1.9        | 0.3         |              |
| CJ-1  | NISP | 180          | 17          | 1           | 11          | 50           | 1           | 1           | <b>261</b>   |
|       | %    | 68.97        | 6.51        | 0.38        | 4.21        | 19.16        | 0.38        | 0.38        |              |
|       | LN   | 4.23         | 1.87        | -0.96       | 1.44        | 2.95         | -0.96       | -0.96       |              |
| CJ-2  | NISP | 1190         | 215         | 10          | 4           | 216          | 144         | 20          | <b>1799</b>  |
|       | %    | 66.15        | 11.95       | 0.56        | 0.22        | 12.01        | 8.00        | 1.11        |              |
|       | LN   | 4.19         | 2.48        | -0.59       | -1.50       | 2.49         | 2.08        | 0.11        |              |
| CJ-3  | NISP | 1773         | 184         | 8           | 81          | 324          | 51          | 24          | <b>2445</b>  |
|       | %    | 72.52        | 7.53        | 0.33        | 3.31        | 13.25        | 2.09        | 0.98        |              |
|       | LN   | 4.28         | 2.02        | -1.12       | 1.20        | 2.58         | 0.74        | -0.02       |              |
| MOL   | NISP | 636          | 27          | 36          | 11          | 36           | 1           | 7           | <b>754</b>   |
|       | %    | 84.35        | 3.58        | 4.77        | 1.46        | 4.77         | 0.13        | 0.93        |              |
|       | LN   | 4.43         | 1.28        | 1.56        | 0.38        | 1.56         | -2.02       | -0.07       |              |
| ALC   | NISP | 789          | 42          | 37          | 33          | 289          | 25          | 142         | <b>1357</b>  |
|       | %    | 58.14        | 3.10        | 2.73        | 2.43        | 21.30        | 1.84        | 10.46       |              |
|       | LN   | 4.06         | 1.13        | 1.00        | 0.89        | 3.06         | 0.61        | 2.35        |              |
| LOR   | NISP | 619          | 33          | 18          | 22          | 46           | 1           | 10          | <b>749</b>   |
|       | %    | 82.64        | 4.41        | 2.40        | 2.94        | 6.14         | 0.13        | 1.34        |              |
|       | LN   | 4.41         | 1.48        | 0.88        | 1.08        | 1.82         | -2.01       | 0.29        |              |
| TOTAL | NISP | <b>7848</b>  | <b>691</b>  | <b>115</b>  | <b>579</b>  | <b>1107</b>  | <b>225</b>  | <b>223</b>  | <b>10788</b> |
|       | %    | <b>72.75</b> | <b>6.41</b> | <b>1.07</b> | <b>5.37</b> | <b>10.26</b> | <b>2.09</b> | <b>2.07</b> |              |
|       | LN   | <b>4.29</b>  | <b>1.86</b> | <b>0.06</b> | <b>1.68</b> | <b>2.33</b>  | <b>0.74</b> | <b>0.73</b> |              |

present in significant numbers in ALC, but are practically absent from the remaining contexts.

In addition to this, it must be pointed out that some contexts yielded malacofauna and ichthyofauna, particularly an oyster (*Ostrea edulis*) shell sample in ALC and a significant group of remains of hake *Merluccius merluccius* in MOL and ALC, identified as Atlantic based on isotopic analysis (see Alexander *et al.*, Chapter 8).

### Anatomical distribution

The analysis of distribution of body parts was limited to caprines (sheep/goat), the most abundant taxonomic group in all assemblages, and thus the only one with a sufficient number of specimens to undertake the sort of comparative study attempted here.

Fig. 7.4a illustrates that, in most instances, the different anatomical regions are roughly evenly represented, although the neck-axial region is somewhat less common than the rest. The only exceptions to this general trend are found in MOL and ALC. Although other minor differences exist, the most significant are perhaps the greater proportion of neck-axial bones (especially in MOL), the lower presence of the 'lower legs+feet' region, and, specifically in MOL, the greater presence of hind-limbs than of fore-limbs. Concerning this, it was noted that the two coeval assemblages found in Molina de Aragón, that is, from the castle (MOL) and the second phase of occupation of Castil de los Judíos (CJ-2) (Fig. 7.4b), were complementary; in other words, that parts over-represented in MOL were under-represented in CJ-2, and vice versa.

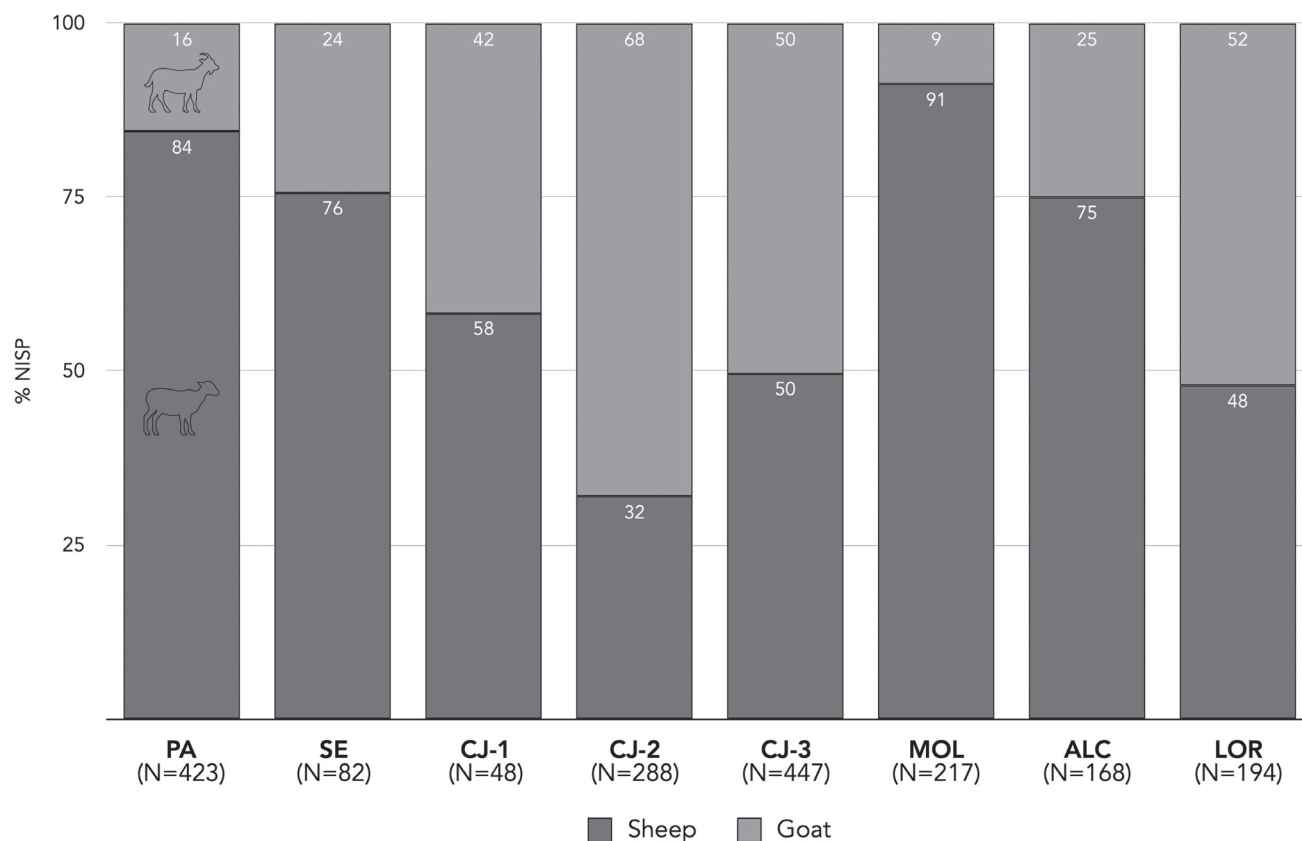


Fig. 7.3. Relative proportion of sheep and goat remains in the assemblages under examination

### Slaughter age

Concerning slaughter age, we shall again focus on caprines, because it is the only group with a sufficiently large sample to enable comparisons. Fig. 7.5 illustrates the percentage of bones whose epiphyses were not fused at the time of slaughter (and thus that belonged to immature individuals) in each of the stages of fusion defined by Silver (1969), as well as total percentage of unfused bones. In all instances – except in Alcázar Real de Guadalajara (ALC), to which we shall return shortly – the percentage of non-fused bones is around 30%, which suggests that most sheep and goats were slaughtered once they were over three and a half years of age. Concerning those that were slaughtered at a younger age, it is interesting to note that no sheep/goats under one and a half years of age were found in LOR and that partially fused bones (1.5–2.5 years) were the most abundant in SE.

The only markedly different pattern is, as noted, found in ALC, where 52% of the bones in which the state of fusion was visible presented unfused epiphyses, which suggests that approximately half the sheep and goats slaughtered there were under three years of age. Within this group, most bones belong to animals slaughtered during their third year, the optimum age in terms of meat yield.

Concerning slaughter age based on teeth growth and wear (Fig. 7.6), some of the assemblages proved to be unrepresentative. However, this method enables a detailed analysis of sheep and goats separately, as well as greater resolution regarding the age of the animals. Overall, goats appear to have been subject to fairly standardised exploitation practices in all of the assemblages that yielded a sufficient number of viable mandibles: a markedly flat survival curve until adult age was reached and a main peak in slaughter in stage F (3–4 years), which is especially pronounced in CJ-3. Greater differences were observed in sheep. In PA, sheep were primarily slaughtered between the ages of 6 and 8 (stage H), and there is even a small group of specimens slaughtered at a senile stage, between 8 and 10 years of age (stage I). In CJ-2, the mortality peak falls in stage B, which corresponds to animals slaughtered during their first year, while in CJ-3 there are more adult specimens; both sites yielded little evidence of slaughter during the sub-adult stage (1–3 years). In ALC, slaughter age based on teeth growth and wear corroborates the results from the epiphyseal fusion stage of postcranial bones, that is, the preferential slaughter of immature and sub-adult specimens of under 2 years of age. Finally, the mortality curve for LOR also suggests the consumption of sub-adults (stage D), although the slaughter

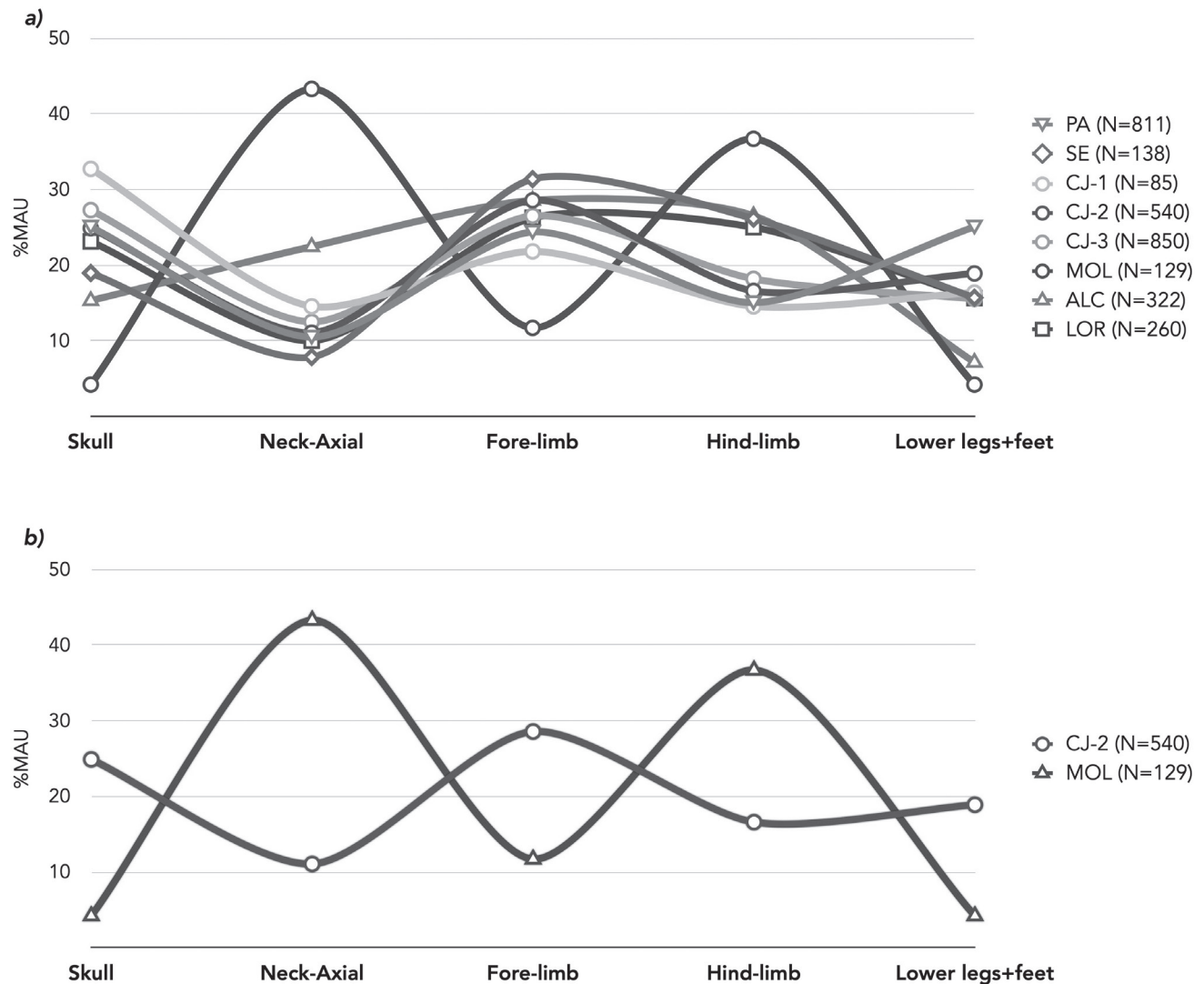


Fig. 7.4. Anatomical distribution of caprines: a) relative abundance (%MAU) of anatomical regions; b) detail of anatomical regions in the coeval assemblages from Molina de Aragón: phase 2 of Castil de los Judíos (CJ-2) and the castle of Molina (MOL). N=MAU

peaks correspond to much later stages, between 4 and 8 years of age (stages G and H).

### **Carcass management and food preparation marks**

The study of carcass management and food preparation tasks will focus on the marks left by each of the phases into which the reduction of the carcasses into pieces can be divided (butchering marks). In caprines, we shall first examine the two main types of marks attested (chops and cuts) and their inferred function (skinning, quartering, filleting, and marrow extraction) (Fig. 7.7). Chops tend to be more numerous than cuts in all instances, especially in MOL, where chops account for 87% of all the marks identified. In terms of inferred function, based on mark

type, location and orientation, there are only small differences from site to site, again with the exception of ALC, suggesting fairly standardised carcass reduction practices. The most commonly inferred function is quartering, and a roughly even frequency of filleting and marrow extraction was also attested.

As noted, ALC stands out as the only exception, with a notably higher frequency of filleting marks compared to other sites. This would suggest the use of specific cooking practices. The evidence of this practice is so obvious that in some cases, for instance the bones illustrated in Plate 7.2, the marks were present all over the bone surface; it is argued that this had to do with the status of consumers. Moreover, ALC is distinctive for the presence of bones with evidence



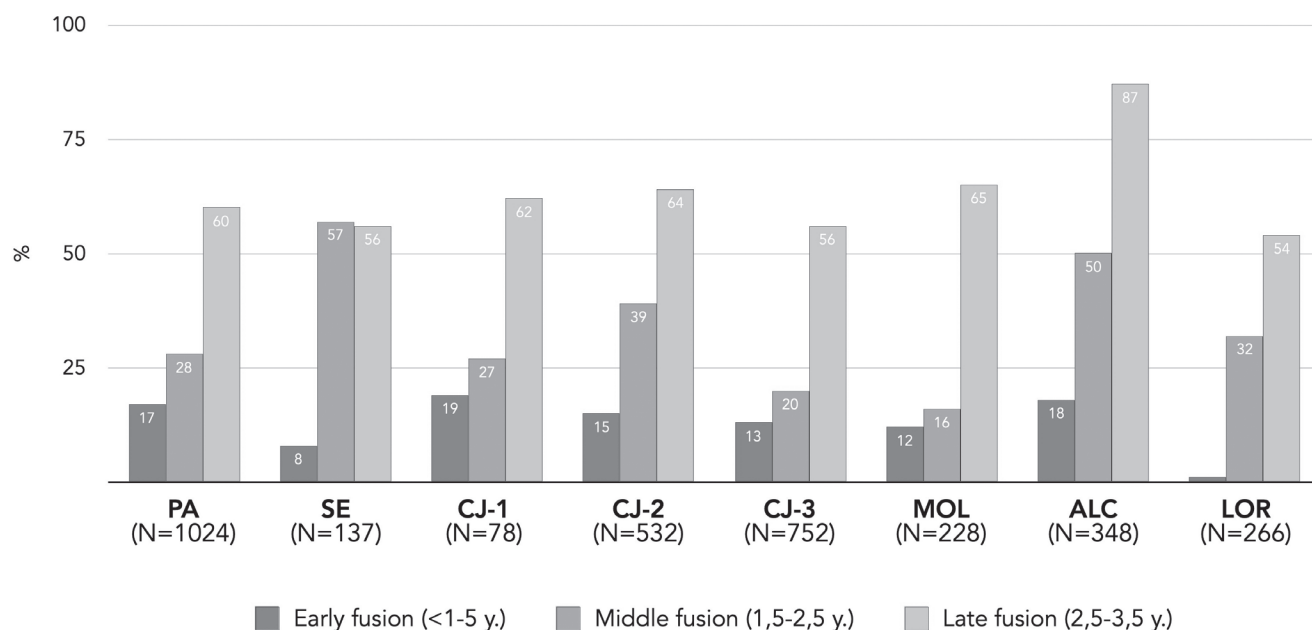


Fig. 7.5. Slaughter age of caprines based on the state of fusion of epiphyses in post-cranial bones, expressed as the percentage of unfused bones (belonging to juvenile individuals) within each of the age groups proposed by Silver (1969). N=Total number of bones in which the state of fusion could be established. The proportion of unfused bones in the different samples are the following: PA=32%; SE=30%; CJ-1=32%; CJ-2=34%; CJ-3=26%; MOL=34%; ALC=52%; LOR=23%

of thermo-alteration confined to specific areas rather than affecting the entire bone, as shown in Plate 7.3. This rules out these marks being caused by waste burning, and strongly suggests specific culinary practices involving roasting the meat on the bone.

One final aspect to consider regarding carcass management involves a distinctive type of butchering mark found on femurs and tibiae resulting from porging (*nikkur*), a practice that is typically associated with kosher butchering and implies ‘the cutting away of forbidden fat and veins from kosher meat’ (Eisenstein 1905, 132) (Plate 7.4). This type of mark was found in the two contexts related with Jewish groups (i.e. CJ-2 and LOR), but, interestingly, also in the Andalusi site of PA.

### Biometrics

Biometric analysis focused exclusively on sheep postcranial bones as it is the most widely represented taxa. In order to better interpret the sample, assemblages from early Islamic Córdoba, specifically Šaqunda (8th–9th century), Cercadilla-Emirate phase (CER-1, 8th–9th century), and Cercadilla-Caliphate phase (CER-2, 10th–11th century) (García 2019, 2023a, 2023b), as well as the early modern assemblage of Cartuja, Granada (CAR, 16th century) (García *et al.* 2021) were taken into account for purposes of comparison. Based on the limited metrical data available

(N=10) from CJ-1, it was decided to exclude this site from the analysis.

As illustrated by Fig. 7.8, most sites follow a unimodal distribution of metrical data, while some show a peak and tail distribution (i.e., CJ-2 and CJ-3), suggesting the presence of a single sheep type in each site. Moreover, as the measurements and bones used for this analysis were those less affected by sexual dimorphism and post-fusion growth, the changes observed are unlikely to be the result of different sexual and age compositions.

The comparison of data and the statistical evaluation of differences (Table 7.3) resulted in separating the specimens into three size groups. The primary observation is the analogous size of sheep present at PA and CJ-3, which overall are smaller in size in comparison to other analysed sites. A second group of medium-size sheep comprises those animals present in CJ-2, MOL and LOR, as well as in SAQ and CER-1, although the samples from MOL and CER-1 are different in statistical terms (Table 7.3). It is important to note that the size of the sheep present in the two phases of occupation of Castil de los Judíos for which we have sufficiently representative evidence (i.e. CJ-2 and CJ-3) present statistically significant differences, while the coeval assemblages from CJ-2 and MOL are markedly similar. Finally, a third size group comprises the sheep present in SE and ALC, as well as in the Caliphate context

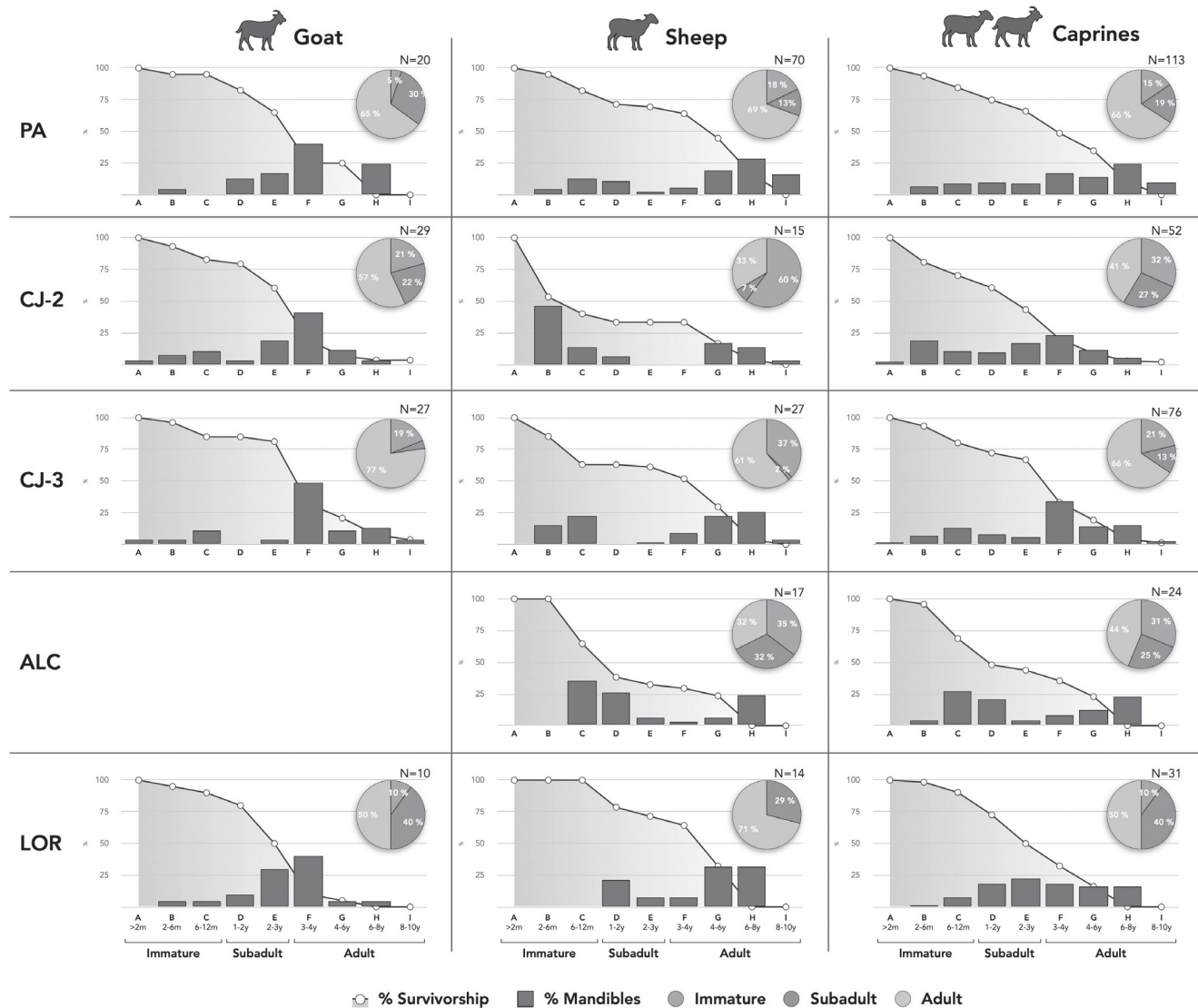


Fig. 7.6. Slaughter age of sheep and goats (taken separately and together as members of the Caprinae subfamily), based on Payne (1973) and the age groups suggested by Greenfield (1988). N=Number of mandibular sequences considered in each site

in Cercadilla (CER-2) and in the early modern contexts in Cartuja (CAR), which are bigger in size in comparison to other sites, although significant statistical differences between SE and CER-2 exist.

## Discussion

These zooarchaeological variables are extremely valuable for studying animal exploitation, management, distribution and consumption in the sites under examination, which in turn can greatly contribute to increasing our understanding of daily life in medieval Iberian frontiers. However, given the volume of data and the space available, the following discussion will be limited to a rough comparison, leaving a more fine-grained analysis for future works.

The taxonomic composition of the archaeofaunal assemblages examined reveals that the animal element in the diet was roughly the same across all sites, namely sheep/goat, cattle and chicken. This suggests a dietary nexus between all human groups represented, no doubt the result of the geographical niche and the structural socio-alimentary traditions they shared. Despite this, some differences can be noted, notably in terms of varying proportions of sheep and goats from site to site. Although sheep were more numerous overall, in all three assemblages from CJ and in LOR, goats were more or less as numerous as sheep, and in CJ-2 they outnumbered them by some distance. This aligns with previous studies indicating a higher prevalence of goats over sheep in Jewish contexts in medieval Iberia, as observed in Mota de Judíos (Moreno 2023), Castro de los

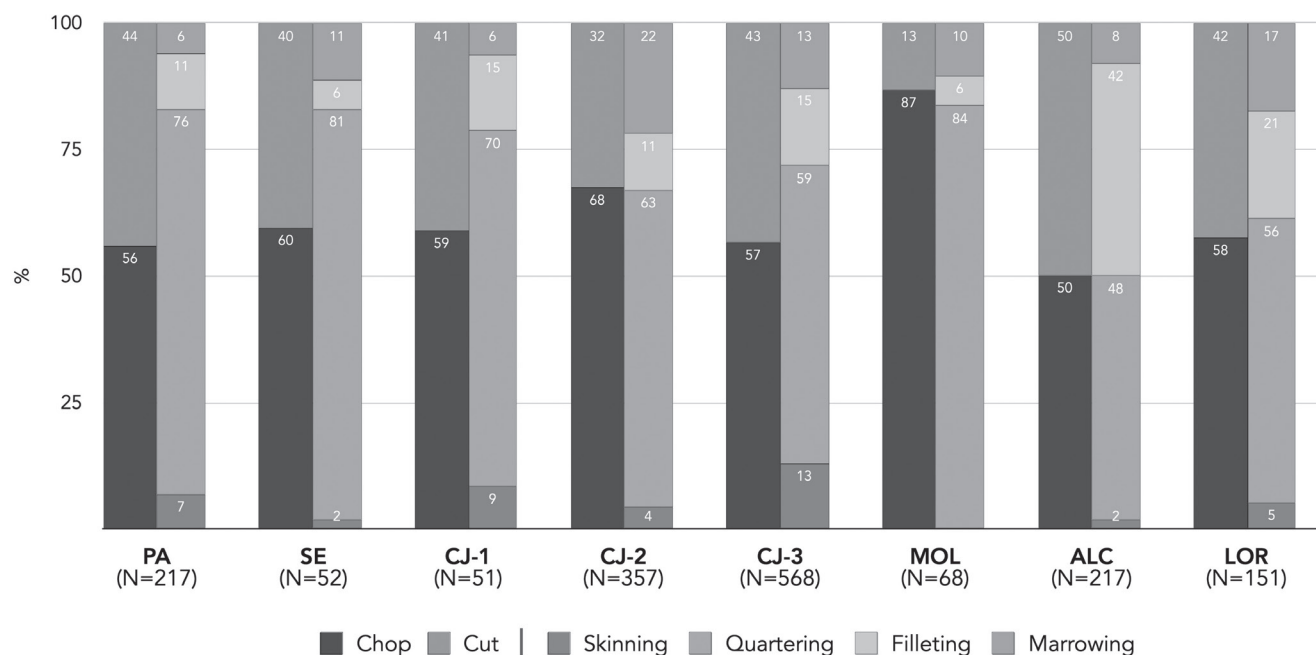


Fig. 7.7. Relative frequency of butchering marks and inferred function. N=Number of remains considered in each case

Judíos (Fernández and Martínez 2015) and Atienza (García and Medina in preparation).

Beyond this, the relative frequency of other animal species results in highly interesting observations. Suids are only represented, and in small numbers, at MOL, ALC and LOR. The first two clearly correspond to Christian contexts, confirming previous observations concerning the presence of *Sus* in the zooarchaeological record of medieval Iberia (Morales *et al.* 2011; Moreno 2013; García 2023a, 2023b; Grau 2023), as well as their value as an ethno-religious marker. On the other hand, the presence of this species in the Jewish quarter of Lorca (LOR) could be attributed, as recently suggested by García *et al.* (2024), following Mik Lisowski's analysis (2019, 298–304), to a combination of cultural and post-depositional factors. However, it should be noted that the Lorca assemblage shows some peculiar characteristics, as we shall see below.

Leporids (rabbit/hare) are present in all sites, except for CJ-2, which coincides with the use of the area as a Jewish quarter. The non-kosher nature of this taxonomic group makes it a good ethno-religious indicator. Although quantitatively small, the presence of rabbit in LOR could be related to the same factors that explain the existence of pig remains in this context. Equally interesting is the large proportion of leporids in SE, which recalls the results obtained by Josep Maria Lloró (1991) in the same city; in this earlier study, leporids accounted for 22% of all remains identified, suggesting the frequent consumption of these animals in late Andalusi Mursiya.

Geese are only present in significant numbers in CJ-2 and, to a lesser extent, in CJ-3 and ALC. Mounting evidence increasingly suggests that the consumption of this species was characteristic of Jewish communities (Grau 2023; Moreno 2023; García *et al.* in press), a pattern seemingly confirmed in CJ-2 but not in LOR, representing another evidence of the distinctive dietary behaviour of the inhabitants of this Jewish quarter. Furthermore, the presence of geese in ALC must be contextualised within the high status of the food served in this space, as also suggested by Idoia Grau (2023, 27) in the castle of Treviño, where the species is highly represented.

The group constituted by wild birds (mostly, partridge, pigeon and several species of small Passeriformes), is present in large numbers only in ALC, potentially also in relation to the elite consumption habits that seem to characterise the site. A group of oyster shells also found there, although small, could be pointing in the same direction; this marine bivalve must have been imported from a coastal region still to be determined, as was done with the remains of hake found in MOL and ALC, which, based on isotopic analysis, came from the Atlantic (Alexander *et al.*, Chapter 8). In relation to this, the presence of hake in MOL, alongside other evidence (see below), is consistent with the identification of the group that inhabited the site as a temporary military garrison, as it is known that hake was delivered to Christian troops in great quantities to comply with the ecclesiastical mandate to refrain from eating meat on Fridays and Saturdays (Serrano 1997; Grumett and Muers 2010).



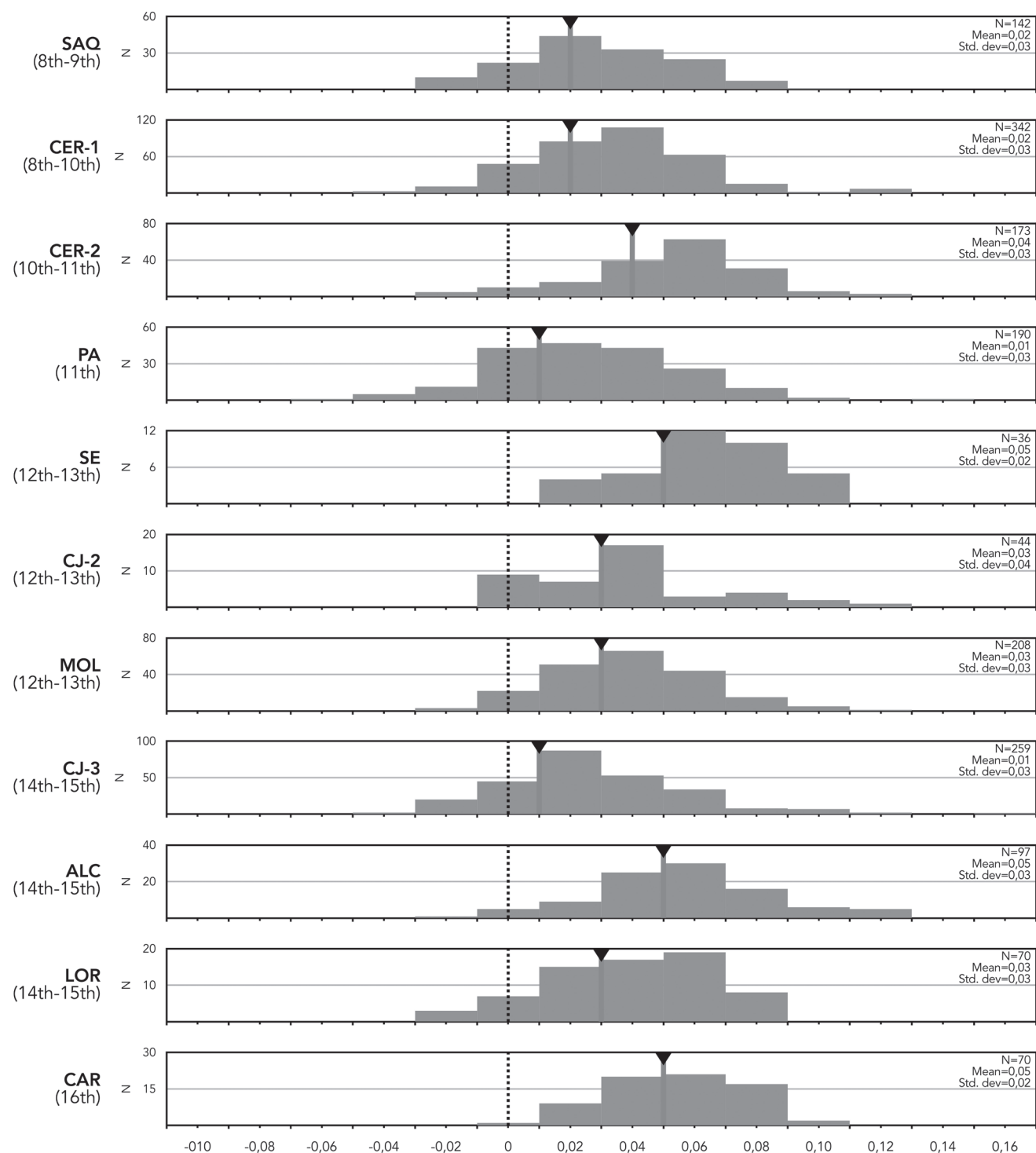


Fig. 7.8. Log-ratio diagrams of measurements of post-cranial measurements of sheep remains. The vertical solid line indicates the mean for each sample, while the vertical dotted line represents the standard (Davis 1996: =0). The figures to the right include the size of the sample, the mean, and the standard deviation

Table 7.3. Student's t-test p-values for the width+depth of sheep post-cranial bones. Lower p-values ( $p < 0.05$ ) suggest that the differences in size between two entries is statistically significant, while high p-values ( $p > 0.05$ , shadowed) suggest that no significant differences in statistical terms exist

|       | SAQ          | CER-1        | CER-2        | PA           | SE           | CJ-2         | CJ-3         | MOL          | ALC          | LOR          | CAR          |
|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| SAQ   | –            | <b>0.876</b> | <0.001       | 0.026        | <0.001       | <b>0.134</b> | 0.013        | <b>0.122</b> | <0.001       | <b>0.428</b> | <0.001       |
| CER-1 | <b>0.876</b> | –            | <0.001       | 0.007        | <0.001       | <b>0.078</b> | 0.002        | 0.035        | <0.001       | <b>0.322</b> | <0.001       |
| CER-2 | <0.001       | <0.001       | –            | <0.001       | 0.015        | 0.004        | <0.001       | <0.001       | <b>0.320</b> | <0.001       | <b>0.338</b> |
| PA    | 0.026        | 0.007        | <0.001       | –            | <0.001       | 0.007        | <b>0.960</b> | <0.001       | <0.001       | 0.017        | <0.001       |
| SE    | <0.001       | <0.001       | 0.015        | <0.001       | –            | 0.003        | <0.001       | <0.001       | <b>0.126</b> | <0.001       | <b>0.066</b> |
| CJ-2  | <b>0.134</b> | <b>0.078</b> | 0.004        | 0.007        | 0.003        | –            | 0.003        | <b>0.599</b> | 0.022        | <b>0.478</b> | 0.018        |
| CJ-3  | 0.013        | 0.002        | <0.001       | <b>0.960</b> | <0.001       | 0.003        | –            | <0.001       | <0.001       | 0.008        | <0.001       |
| MOL   | <b>0.122</b> | 0.035        | <0.001       | <0.001       | <0.001       | <b>0.599</b> | <0.001       | –            | <0.001       | <b>0.680</b> | <0.001       |
| ALC   | <0.001       | <0.001       | <b>0.320</b> | <0.001       | <b>0.126</b> | 0.022        | <0.001       | <0.001       | –            | <0.001       | <b>0.996</b> |
| LOR   | <b>0.428</b> | <b>0.322</b> | <0.001       | 0.017        | <0.001       | <b>0.478</b> | 0.008        | <b>0.680</b> | <0.001       | –            | <0.001       |
| CAR   | <0.001       | <0.001       | <b>0.338</b> | <0.001       | <b>0.066</b> | 0.018        | <0.001       | <0.001       | <b>0.996</b> | <0.001       | –            |

For the remaining zooarchaeological parameters, only caprines were considered, as these were the most abundant, and therefore most informative, taxonomic group. Concerning slaughter age, the state of fusion of post-cranial bones suggests that sheep and goats were exploited for both meat and secondary products (milk and wool). Only in ALC do immature individuals predominate, indicating a preference for more tender meats, again suggesting high-status consumption patterns. Dental data give better resolution and reveal interesting differences in exploitation patterns. According to these data, in most sites goats were slaughtered as they reached adulthood, indicating the joint exploitation of milk and meat. Sheep present more variation from site to site, including the preferential slaughter of adult and even senile specimens (PA and LOR) or of immature specimens (CJ-2), or the coexistence of several age groups (CJ-3 and ALC).

Anatomical regions of sheep and goat were, in broad terms, evenly represented in all samples, including regions with the most flesh (i.e. top half of limbs and axial region) and the leanest ones (i.e. metapodials and phalanges). This points to the management of more or less whole carcasses on-site, so it can be argued that the distribution of animal products was direct and decentralised, and that whole animals were processed near consumption points. The only exceptions are found in MOL and ALC, where fleshier regions predominate, suggesting specific distribution patterns that favoured anatomical parts with the greatest alimentary value. Especially relevant is the comparison between MOL and CJ-2, which have a similar chronology and were part of the same settlement, Molina de Aragón. The asymmetrical anatomical distribution curves indicate complementary distribution patterns between Castil de los Judíos and the

castle of Molina. Perhaps, as suggested for other Jewish contexts dated to the medieval (Zivotofsky 2006; Valenzuela *et al.* 2014) and modern periods (Ijzereef 1988), this evidence might indicate the purchase (Riera 1988, 306) or the extraction by coercive means (Estepa 2012; Motis and Berges 2014, 27) of certain anatomical regions from Castil de los Judíos, by the consumer group responsible for the remains found in the castle.

Butchering marks suggest similar fleshing and culinary practices across most sites, which typically left some meat on the bone for stewing with vegetables. The sites that stand out in this regard are MOL and, again, ALC. In the former, the clear predominance of chops over cuts indicates a blunt approach to butchering, with axes or cleavers rather than knives. The large number of filleting marks in ALC, on the other hand, may suggest either that the meat was deboned prior to cooking – indicating the use of complex culinary techniques – or, more likely, the work of a *trinchante*, a servant responsible for carving meat at the table with such precision that dedicated treatises, such as that of the Marqués de Villena (15th century), were written on the subject. In fact, the presence of long bones exhibiting partial thermo-alteration marks in the same context further supports this interpretation, suggesting the use of economically inefficient culinary practices, such as roasting, which is commonly associated with high-status consumption contexts (Woolgar 1999, 140; Montanari 2004, 58).

In three of the sites, bones presented butchering marks compatible with porging or *nikkur*, which consisted in the removal of parts regarded as impure by *kashrut* (Jewish dietary norms) and which, therefore, must be related to Sephardim communities. The greater quantity of so-called

impure parts – especially the *gid hanashed* or sciatic nerve – in the rear legs, made this the most thoroughly porged anatomical region in these contexts (Zivotofsky 2006). Recently, Mik Lisowski (2019) characterised certain indicators of this practice, such as the removal by chopping of the epiphyses of femurs and tibias, and the presence of striations or ‘scrapping marks’ in the central diaphysis of these same bones. All of these marks have been attested in the two Jewish quarters under analysis, that is, CJ-2 and LOR, further confirming the value of these as an ethno-religious marker in medieval Iberian contexts. However, it is interesting to note that some of these marks are also present in the Andalusi settlement of Pla d’Almatà, which suggests the coexistence of several communities at this site.

Finally, metrical data of sheep postcranial bones reveal the existence of several morphotypes, which in turn suggest interesting exploitation patterns. Although these will have to be examined in more detail in the future, they can be summarised as follows. One type, found in PA and CJ-3 is, even smaller than that found in Córdoba during the Emirate period in SAQ and CER-1, which was interpreted as corresponding to ‘not improved’ sheep (García 2019, 2023c). A second type, similar in size to the specimens from Córdoba, is found in CJ-2, MOL, and LOR. Two interesting aspects can be pointed out about this group. First, the metrical similarity of the sheep found in both Jewish quarters (CJ-2 and LOR), which strongly suggests that Sephardim communities consumed ‘not improved’ sheep types. Second, the metrical comparability of the sheep found in the two coeval assemblages in Molina de Aragón (CJ-2 and MOL), which likely suggests that they represent the same type and that the sheep consumed in the castle of Molina was supplied by the Jewish community in Castil de los Judíos. Finally, the metrical data points to the presence of a third, larger type in SE and ALC, suggesting the operation of centralised, specialised supply channels similar to those that have been argued to be active in Cercadilla during the Caliphate period (CER-2) (García 2019, 2023a, 2023b) and in early modern Cartuja (García *et al.* 2021), where sheep are metrically similar to this group. This not only confirms the intensification of sheep rearing during the Islamic period, previously observed in al-Andalus (Davis 2008; García 2023c) and Sicily (Aniceti and Albarella 2022), but also reveals the consumption of this sort of ‘improved’ sheep in high-status late medieval Christian contexts, such as the Alcázar Real de Guadalajara.

## Conclusions

As will be clear by now, the study of animal remains from archaeological contexts is a useful tool to study human/animal interaction in the past. Given the changing, historically contingent of patterns of exploitation, management, distribution,

preparation and consumption of animal products in the past, this study can shed light on everyday life in archaeological contexts and, specifically, in medieval frontiers.

The zooarchaeological work undertaken within the framework of the Landscapes of (Re)Conquest project has generated a large volume of unpublished data, which reveals significant variations – along with intriguing similarities – among different occupation contexts. A general overview of results and their (low-resolution) comparison leads to a series of broad conclusions that will have to be refined in future work. First, caprines, cattle and chicken were the primary sources of meat; however, various factors also contributed to the consumption of other species, including suids, leporids, geese, wild birds, oysters and hake. Evidently, the primary factor influencing these transformations pertains to the dietary implications associated with successive shifts in religious hegemony resulting from processes of conquest, colonisation and migration. These regime changes triggered profound modifications in eating habits at multiple levels, including the selection of foodstuffs, methods of preparation, modes of consumption and, more broadly, the knowledge, practices and beliefs – some of which ‘archaeologically invisible’ – linked to food culture. Notable examples include the general decline in pig farming and consumption observed during the early Andalusi period (García 2023a) and the persistence of existing husbandry and culinary traditions by Morisco communities following the Castilian conquest, as evidenced in Cartuja (García *et al.* 2021). These cases underscore the dynamic nature of frontier interactions and their impact on the daily lives of historical actors. Second, the carcasses of caprines (the most abundant taxonomic group) appear not to have been managed in a centralised manner, but were directly managed by the consumers, except for ALC and MOL, where there is evidence for specialised supply centres that favoured the use of anatomical regions with the greatest meat yield. Third, the age at which sheep and goats were slaughtered also suggest non-specialised exploitation patterns, except, again, for ALC, where preference was given to the tenderest meats. Fourth, in all instances meat cuts tended to leave the flesh on the bone, except, one more time, for ALC, where more complex techniques, such as the fleshing out of the meat prior to cooking, were attested. At the same time, marks compatible to *porging* in the Jewish communities in CJ-2 and LOR, but also in PA, highlights the value of this type of evidence for the identification of Sephardim groups, even in sites where no prior evidence to their presence existed, like in PA. Lastly, biometrical data of sheep reveals new evidence about morphometric varieties in different regions and periods and improves our understanding of sheep exploitation patterns. This will have to be examined in greater detail in future studies.

Additional aspects are worth of attention. First, the peculiar nature of the archaeofaunal assemblage found in the Alcázar Real de Guadalajara. The consumption of



wild birds and oysters, the high frequency of anatomical regions with the greatest meat yield, coupled with evidence of cooking practices not found elsewhere (i.e. fleshing out bones and roasting meat cuts), point to high-status consumption patterns, in line with the socio-economic position of the Castilian elite that frequented the site. On the other hand, the comparison of two coeval assemblages from Molina de Aragón, phase 2 in Castil de los Judíos (CJ-2) and the castle of Molina (MOL), could suggest a potential meat supply chain from the former to the latter; biometric data and the distribution of different anatomical regions suggest that the meat consumed at the castle may have been processed in the Jewish quarter. The diet of the consumer group – tentatively interpreted as a temporary military garrison – was complemented with hake supplied from the Atlantic regions.

In conclusion, this study has shed light on various issues while opening new avenues of analysis for the future. The resolution of this macro-scale comparative analysis, which was deliberately kept low, has only allowed for a very superficial consideration of many issues related to the way of life in various frontier regions in medieval Iberia, reflecting the inverse correlation, in terms of historical analysis, between scale and human agency. As rightly pointed out by Aslanian *et al.* (2013, 1444), ‘the greater the scale of analysis (temporally or spatially), the less room is left for accounts of human agency’. In addition to this, we wish to emphasise the importance of multi-scalar approaches in the design of archaeological projects. In the future, efforts should focus on zooming in analytically to dig deeper into individual agency and the everyday practices shaping human-animal relations in medieval frontiers.

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The zooarchaeological work undertaken within the framework of the Landscapes of (Re)Conquest project would not have been possible without the help, support and interest of numerous professionals in excavations, museums and other institutions. In particular, we wish to thank C. Alòs (Museu de la Noguera), H. Kirchner (UAB), J. Eiroa and M. Celma (UMU), M. Á. Cuadrado and F. Aguado (Museo de Guadalajara) and J. Arenas (UDIMA). Thanks are also due to V. Aniceti, who thoroughly reviewed the manuscript and provided constructive feedback and very valuable suggestions that substantially improved the paper.

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# Diet and animal husbandry on an Iberian frontier: biomolecular perspectives from Guadalajara

*Michelle Alexander, Maite I. Garcia-Collado,  
Samantha Greeves and Marcos García García*

## Introduction

This contribution presents the results of a multi-isotopic analysis of human and animal populations combined with Zooarchaeology by Mass Spectrometry species identification (ZooMS) to explore diet within Guadalajara, one of the principal frontiers within the Landscapes of (Re)Conquest project. Food represents a dynamic material culture that plays an active role in constructing and maintaining identities, which can mark inclusion or exclusion in society (Twiss 2012). Diet varies due to multiple biological, cultural and environmental factors, often simultaneously and dynamically, including age, sex, social status or wealth, occupation and geographical location (Twiss 2012, 2019). The multi-faith nature of medieval Spain, where Muslims, Christians and Jews lived under successive changes of Muslim and Christian political rule, provides a rich context for exploring subsistence, from production to consumption (García García 2025). Isotope analysis is increasingly applied to investigate dynamics in medieval agriculture and diet in the Iberian Peninsula, shedding light on the everyday practices of different faith communities (e.g. Alexander *et al.* 2015; Guede *et al.* 2017; Lubritto *et al.* 2017; Garcia-Collado *et al.* 2019; Inskip *et al.* 2019; López-Costas and Müldner 2019; Toso *et al.* 2021; Jiménez-Brobeil *et al.* 2021; Pérez-Ramallo *et al.* 2023; MacRoberts *et al.* 2024). In contrast to the better-established isotopic research on medieval populations that encompasses the Iberian Peninsula's northern, southern, and coastal (eastern and western) areas, the central region, including Guadalajara, has received comparatively little attention. The results from this project address this disparity, providing a biomolecular perspective on animal management and the lifeways of humans with different religious affiliations in the central Christian-Muslim frontier.

We explored dietary patterns by analysing stable carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotope ratios in human and animal bone collagen. For recent reviews detailing the principles and applications of these methodologies to explore past diets, see, e.g., Ambrose 1993; López-Costas and Alexander 2019; Beasley and Somerville 2023. In brief,  $\delta^{13}\text{C}$  values vary characteristically between terrestrial and marine resources and between plants that use different photosynthetic pathways ( $\text{C}_3$  and  $\text{C}_4$ ). Drought-tolerant  $\text{C}_4$  crops possess less negative  $\delta^{13}\text{C}$  values than the more common temperate  $\text{C}_3$  crops (wheat, barley, oats, rye, most trees, etc).  $\text{C}_4$  crops, including millets, sorghum and sugarcane, are recorded both in written and archaeobotanical medieval records from the Iberian Peninsula (Peña-Chocarro *et al.* 2019; Peña-Chocarro and Pérez-Jordà 2023; Chapter 6). The  $\delta^{15}\text{N}$  of consumers reflects their trophic level, with the  $\delta^{15}\text{N}$  of consumer collagen typically being around 3–5‰ higher than their diet, although there are some complexities, particularly for human diets (Bocherens and Drucker 2003; Hedges and Reynard 2007; O'Connell *et al.* 2012). Collagen  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  primarily reflect the long-term average of the protein sources in the diet over more than a decade before death (Ambrose and Norr 1993; Hedges *et al.* 2007). However, different skeletal elements have differing rates of bone turnover and, therefore, reflect different temporal resolutions (Quinn *et al.* 2025). Multiple environmental and biomolecular factors add further complexity to the interpretation of consumer  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ , such as baseline environmental conditions (Szpak 2014; Ferrio *et al.* 2020) and metabolic status (Reitsema 2013).

The application of stable isotope analysis to animal remains has proven successful in revealing dynamics in foddering and animal management in medieval societies,

either through targeting animal remains alone (Fisher and Thomas 2012; Millard *et al.* 2013; Sirignano *et al.* 2014; Stroud 2022) or when analysing animals to provide an isotopic baseline for human diets (Alexander *et al.* 2015, 2019). Sampling animals for both scenarios has been carried out in this study, providing complementary insights to zooarchaeological analysis from these sites in Guadalajara (see Chapter 7). Additionally, ZooMS was applied to specifically differentiate sheep and goat samples via protein-based taxonomic identification (Buckley *et al.* 2010), and targeted radiocarbon dating was carried out on key contexts from selected sites.

### Studied sites

This contribution focuses on seven sites in the western area of the modern-day province of Guadalajara (Plate 8.1). Among these, the Atienza Jewish quarter was a primary excavation site within the project, with the remainder representing secondary sites whose materials were accessed with permission from museum archives. All of them are described in Chapter 3 and summarised briefly below. Collectively, the sites date between the 10th and 15th centuries, spanning the region's transition from Islamic to Christian political control. In total, 45 humans and 166 animals, including mammals, birds and fish, were sampled. The nature and number of individuals sampled from each site are outlined in Table 8.1, with animal samples broken down by species in Table 8.2.

**Palacio de los Guzmán (PG)** is located north-east of the old city of Guadalajara (Cuadrado and Crespo 2018), near one of the main mosques during the Caliphal period.

In 1992, archaeological excavations were carried out to transform the 17th-century palace of the Guzmán family into a student hall (Cuadrado 1992). Destruction caused by the construction of the palace and other buildings limited the excavation, but part of a stone-built domestic structure was revealed, interpreted as a partially underground kitchen with a paved fireplace. Abundant artefacts were recovered around the hearth, including pottery, fauna remains and glass and metal items, which date the context to the 10th century. The 25 fauna analysed from this site came from the area surrounding the fireplace.

**Cathedral of Sigüenza (CS):** Excavations in front of the southern façade between 1997 and 2002 revealed part of its cemetery (Cardín and Cuadrado 1998). A total of 23 burials containing a minimum number of 43 individuals were uncovered (Gómez Pérez and Rodríguez González 2011). Burials had anthropomorphic outlines oriented in a west–east direction, lined with stone blocks or slabs. Most of them contained an individual in a supine position and several other individuals in a secondary position. Following the Islamic conquest, Sigüenza remained under Muslim control until the 12th century. Interestingly, radiocarbon dates suggest that this funerary area dates between the late 10th and 13th centuries, indicating that some of the analysed burials pre-date Sigüenza's Christian conquest. Fifteen adults were sampled for this study, including both ribs and long bones for ten individuals for comparison.

**Cemetery of Guadalajara (CG):** A medieval funerary area was found under the municipal graveyard located in the city's north-western area, which was inaugurated in the 19th century and is still in use. In 2010, the renovation of a

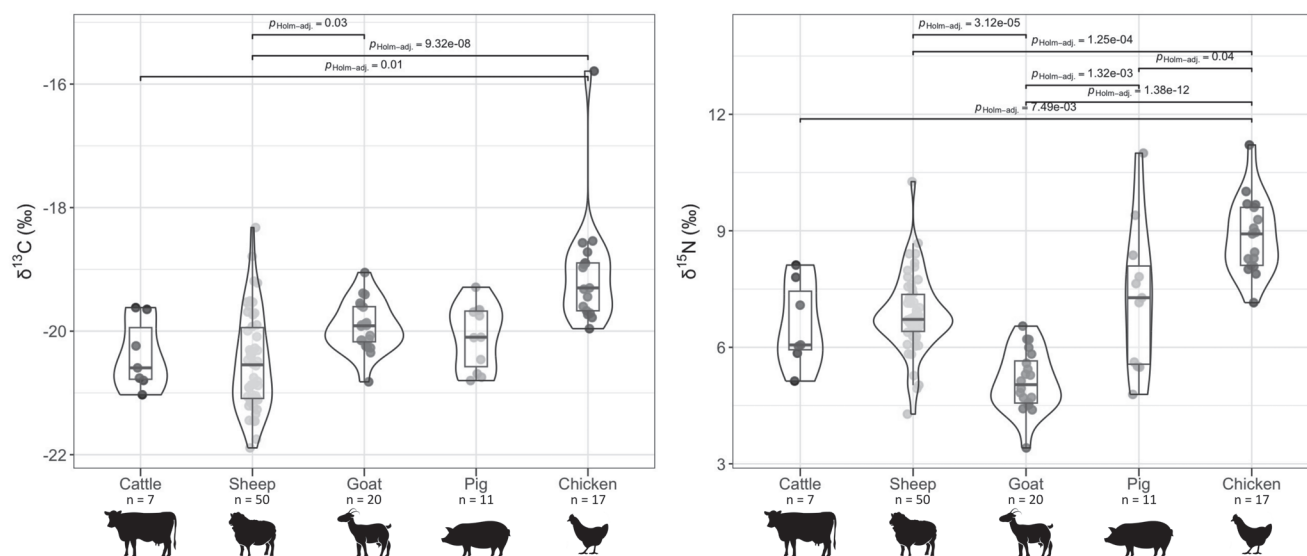


Fig. 8.1. Carbon (left) and nitrogen (right) isotopic ratios of the main domesticates from Alcázar Real de Guadalajara (ALC) with > 4 data points. Bars indicate statistically significant Kruskal-Wallis tests with Dunn's post hoc pairwise comparisons and associated *p* values (Bonferroni adjusted)

Table 8.1. List of sites sampled for the Landscapes of (Re)Conquest project and their attributes. Sex (only humans): F = female or probable female, M = male or probable male, U = undetermined. \*Sites that have been radiocarbon dated, see main text

| Site                               | Sample type | N   | Sex        | Chronology             | Culture/faith | Type                   |
|------------------------------------|-------------|-----|------------|------------------------|---------------|------------------------|
| Palacio de los Guzmán (PG)         | Animal      | 25  | –          | 10th C.                | Islamic       | Urban                  |
| Cathedral of Sigüenza (CS)         | Human       | 15  | 3F, 8M, 4U | Late 10th–13th C.*     | Christian     | Urban                  |
| Cemetery of Guadalajara (CG)       | Human       | 7   | 1F, 6U     | 10th–11th C.*          | Islamic       | Urban                  |
|                                    | Human       | 2   | 2 U        | 15th–early 16th C.*    | Christian     |                        |
| Castle of Zorita de los Canes (ZC) | Human       | 11  | 1M, 10U    | 13th–15th C.           | Christian     | Castle, military order |
|                                    | Animal      | 7   | –          |                        |               |                        |
| Alcázar Real de Guadalajara (ALC)  | Animal      | 124 | –          | Mid-13th–14th C.*      | Christian     | Urban, high status     |
| Atienza Jewish quarter (AT)        | Animal      | 10  | –          | Mid-14th–early 15th C. | Jewish        | Urban                  |
| Campus de la Cristinas (CRS)       | Human       | 10  | 6F, 4M     | 14th–15th C.           | Undetermined  | Urban                  |

Table 8.2. Animal samples analysed from each site for the Landscapes of (Re)Conquest project, grouped by site and species. Note fish are not broken down by species

| Site                               | Cattle | Sheep | Goat | Sheep/Goat | Pig | Dog | Rabbit | Chicken | Goose | Partridge | Pigeon | Fish | Total |
|------------------------------------|--------|-------|------|------------|-----|-----|--------|---------|-------|-----------|--------|------|-------|
| Palacio de los Guzmán (PG)         | 3      | 16    | 2    | –          | –   | –   | 1      | 3       | –     | –         | –      | –    | 25    |
| Castle of Zorita de los Canes (ZC) | 2      | 4     | –    | –          | 1   | –   | –      | –       | –     | –         | –      | –    | 7     |
| Alcázar Real de Guadalajara (ALC)  | 7      | 50    | 20   | –          | 11  | 1   | 2      | 17      | 4     | 2         | 1      | 9    | 124   |
| Atienza Jewish quarter (AT)        | 1      | 1     | 7    | 1          | –   | –   | –      | –       | –     | –         | –      | –    | 10    |
| Total                              | 13     | 71    | 29   | 1          | 12  | 1   | 3      | 20      | 4     | 2         | 1      | 9    | 166   |

sector of this contemporary cemetery led to archaeological excavation that discovered 57 medieval burials (Vara and Martínez Peñarroya 2017). Most of the graves were oriented in south-west–north-east or south–north directions, forming rows, and they contained a single individual in a lateral position facing east without coffin items or grave goods. In addition, there was a single tomb in west–east direction with an individual in a supine position surrounded by coffin nails and grave goods together with the commingled remains of at least one other individual. The excavators interpreted the site as a late medieval Mudéjar cemetery, but the radiocarbon dates obtained as part of this research draw a different picture. According to the new data, the Islamic burials date between the second half of the 10th century and the beginning of the 11th century. Therefore, they pre-date the Christian conquest of Guadalajara and belong to the Caliphal city (Cuadrado and Crespo 2018). The grave with an individual in a supine position, however, dates to the 15th century or the beginning of the 16th century, which identifies it as a Christian burial overlapping the older Islamic cemetery. For this project, nine samples were analysed: seven from Islamic burials and two from the Christian grave.

**Castle of Zorita de los Canes (ZC)** is a fortification on the banks of the Tagus river that came to prominence under

Christian control when it was granted to the military order of Calatrava by the Castilian Kingdom in 1174 (Ballesteros San José 2022). A Christian cemetery was excavated at the castle, which was in use between the 13th and 15th centuries (Urbina Martínez and Urquijo Álvarez 2022). Most of the burials were identified as male, in keeping with the burial ground of a military order (Rissech *et al.* 2022). Eleven human adults and seven animal samples were analysed as part of the Landscapes of (Re)Conquest project. This new data set expands upon a previous publication on the site, which included 21 adult human and 19 animal samples and focused on diet in relation to the site's military context (Pérez-Ramallo *et al.* 2024).

**Alcázar Real de Guadalajara (ALC)** was the Christian royal palace used by the Castilian monarchy as their residence in the city from the Christian conquest at the end of the 11th century until the 15th century when it was consigned to productive activities (Navarro 2006). The best-known phase is the Mudéjar palace built in the 14th century. There is archaeological evidence proving the existence of a previous Emiral fortification dated to between the 9th and 10th centuries, but structures and material culture are poorly preserved (Cuadrado and Crespo 2018). This study's most substantial and taxonomically diverse faunal



assemblage, consisting of 124 analysed samples (mammals, birds and fish), was retrieved from the site. These samples were obtained from the deposits stratigraphically overlying the palace's northern latrines, the abandonment of which has been radiocarbon dated to the period spanning the second half of the 13th through the 14th century (Crespo and Cuadrado 2002). These were abundant in domestic refuse and reflected the high-status consumption patterns of the inhabitants of the royal palace.

**Campus de las Cristinas (CRS)** is named after the Maria Cristina School for Orphan Girls of the Army, established in this north-west area of the city of Guadalajara from 1971 to 2019. Archaeological excavations in 2021, prompted by construction for a new University of Alcalá de Henares campus, uncovered a significant funerary area containing 239 burials (Caballero and Agustí 2021). Most of the graves were simple pits with south-west–north-east orientation and individuals in a supine position, although there were at least two in a lateral position. Fifty per cent of the burials retained coffin elements like wood or nails, while 20% contained grave goods, predominantly beads, pendants, rings and coins. Six burials were distinctive, covered by brick vaults (*lucillos*), all located in the eastern sector of the excavated area. These are considered a characteristic feature of medieval Jewish cemeteries (Ruiz Taboada 2009). However, the vast extension of Campus de las Cristinas, its proximity to the Islamic Caliphal burial ground of the Cemetery of Guadalajara and the growing evidence pointing to the existence of funerary areas used by various religious groups over time (Eiroa 2016) make it difficult to assign this graveyard to a single faith with certainty. Based on material culture, this site dates to the 14th and 15th centuries. No radiocarbon dates are available. Ten individuals from simple pit burials across the cemetery were sampled for this study.

**Atienza Jewish Quarter (AT)**: Material sampled from this site derives from the archaeological excavation conducted in 2022 by the Landscapes of (Re)Conquest project within

the Jewish quarter in Atienza (Mattei *et al.* 2024), located on a hill opposite the castle of this town. These works uncovered a domestic structure and abundant pottery, fauna and metallic materials. Zooarchaeological study showed the predominance of goats over sheep, the abundance of geese and the absence of non-kosher species such as pigs and rabbits, as expected from a Jewish cultural context (García García *et al.* 2025). Radiocarbon dates confirmed the occupation of the hill during the 13th and 14th centuries and its abandonment between the end of the 14th and the beginning of the 15th century. The isotopic data reported here represent a small pilot study formed by ten fauna samples, selected to add to the isotopic baseline for humans, including those from nearby Sigüenza.

### Radiocarbon dating

The basis for the chronology for most sites is relative, based on historical documentation and archaeological material. Three sites, namely Cathedral of Sigüenza (CS), Cemetery of Guadalajara (CG) and Alcázar Real de Guadalajara (ALC), were directly dated by the Landscapes of (Re)Conquest project through radiocarbon analysis of human, sheep and goat bone. Radiocarbon dating was carried out at Vilnius Radiocarbon (Lithuania). Results are reported in Table 8.3. Radiocarbon dates were calibrated with OxCal v.4.4 (Bronk Ramsey *et al.* 2004) using the IntCal20 calibration curve (Reimer *et al.* 2020). No marine correction was carried out for human individuals, as stable isotope results do not indicate the contribution of marine foods to the diet at these sites (see below). All chronologies reported in this contribution take these radiocarbon dates into account.

### Methodology

When sampling human individuals, adults aged 20 years or older were targeted. Due to poor preservation, it was

Table 8.3. Radiocarbon dates. In italics the range with the greatest probability

| Site                              | <sup>14</sup> C Lab code | Sample ID | Context        | Species | <sup>14</sup> C BP (± unc) | <sup>14</sup> C CE cal 2σ              |
|-----------------------------------|--------------------------|-----------|----------------|---------|----------------------------|----------------------------------------|
| Cathedral of Sigüenza (CS)        | FTMC-AC38-4              | CS 06F    | Burial 8 Ind 1 | Human   | 1012±29                    | 990–1049 (74.2%)<br>1081–1152 (21.3%)  |
|                                   | FTMC-AC38-5              | CS 10F    | Burial 14      | Human   | 820±29                     | 1175–1273 (95.4%)                      |
| Cemetery of Guadalajara (CG)      | FTMC-AC38-6              | CG 04     | UF 10          | Human   | 417±29                     | 1429–1511 (86.0%)<br>1592–1620 (9.4%)  |
|                                   | FTMC-AC38-7              | CG 11     | UF 2           | Human   | 1068±28                    | 895–926 (21.2%),<br>948–1026 (74.3%)   |
| Alcázar Real de Guadalajara (ALC) | FTMC-AC38-1              | ALC 0023M | Corte 6        | Sheep   | 713±29                     | 1261–1308 (83.1%)<br>1363–1385 (12.3%) |
|                                   | FTMC-AC38-2              | ALC 0060M | Corte 6        | Goat    | 607±29                     | 1300–1405 (95.4%)                      |
|                                   | FTMC-AC38-3              | ALC 0084M | Corte 6        | Sheep   | 653±28                     | 1280–1328 (45.5%)<br>1349–1395 (50.0%) |

not possible to estimate sex (Table 8.1) for the majority of individuals from the Cemetery of Guadalajara and those sampled for the Landscapes of (Re)Conquest project from the castle of Zorita de los Canes. Sex estimation was also not possible for individuals from the ossuary of the Cathedral of Sigüenza. When sampling human individuals, ribs were preferred. However, in many cases where ribs were unavailable or could not reliably be assigned to a specific individual, the whole transverse section of a long bone was sampled (de Gruchy *et al.* 2024). For animal bone, an effort was made to ensure each individual was sampled only once from each context, e.g., targeting single elements of the same body side where possible (Pálsdóttir *et al.* 2019).

Bone collagen was extracted at the BioArCh facilities in the Department of Archaeology, University of York, following a modified Longin protocol (Longin 1971) with the addition of Ezee filters (Bronk Ramsey *et al.* 2004). Each sample was initially cleaned by removing the outer surface using a sandblaster. Around 0.5g of bone was demineralised in 0.6M HCl at 4°C. When complete, the resultant pliant pseudomorphs were rinsed to neutrality and then gelatinised in 0.001M (pH 3) HCl at 80°C for up to 48 hours. The soluble gelatin was then filtered using Ezee-Filter™ Separator (Elkay Laboratory Products) to remove insoluble debris, frozen for 24 hours at -20°C and finally lyophilised at -55°C for 48 hours.

For isotopic measurement by Elemental Analysis Isotope Ratio Mass Spectrometry (EA-IRMS) 0.4–0.6mg of collagen was weighed out in duplicate into tin capsules and combusted alongside internal and international standards in a Sercon 20–22 continuous flow isotope ratio mass spectrometer coupled to a Sercon gas solid liquid elemental analyser at BioArCh. Data was normalised using a two-point linear correction using repeated measurements of international standard reference materials as calibration standards within each analytical run. These were IAEA 600  $\delta^{13}\text{C}_{\text{true}} = -27.77\text{‰} \pm 0.04$ ,  $\delta^{13}\text{C}_{\text{raw}} = -27.71\text{‰} \pm 0.15$ ,  $\delta^{15}\text{N}_{\text{true}} = 1.00\text{‰} \pm 0.2$ ,  $\delta^{15}\text{N}_{\text{raw}} = 0.86\text{‰} \pm 0.27$ ; IA Cane  $\delta^{13}\text{C}_{\text{true}} = -11.64\text{‰} \pm 0.03$ ,  $\delta^{13}\text{C}_{\text{raw}} = -11.74\text{‰} \pm 0.28$ ; IAEA N<sub>2</sub>  $\delta^{15}\text{N}_{\text{true}} = 20.30\text{‰} \pm 0.2$ ,  $\delta^{15}\text{N}_{\text{raw}} = 20.41\text{‰} \pm 0.28$ . Sample uncertainty for individual samples was calculated separately for both  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  using the Kragten spreadsheet model (Kragten 1994) as outlined in the Good Practice Guide for Isotope Ratio Mass Spectrometry (Dunn and Carter 2018) by combining uncertainties in the values of the reported error associated with the published true value of the international standards, the measured error (precision) values of the international standards in the run and the precision error from the measurement of the two sample replicates. These are expressed as one standard deviation. The maximum uncertainty for all samples across all runs was 0.26‰ for  $\delta^{13}\text{C}$  and 0.33‰ for  $\delta^{15}\text{N}$ . In addition, a homogenised bovine bone extracted and analysed within the same batch as the samples produced the following average values:  $\delta^{13}\text{C} = -23.22\text{‰} \pm 0.19$ ;  $\delta^{15}\text{N} =$

$6.11\text{‰} \pm 0.32$ . This was within the overall mean value from 89 separate extracts of this bone sample measured during 12 months, which produced values of  $\delta^{13}\text{C} = -23.14\text{‰} \pm 0.16$  and  $\delta^{15}\text{N} = 6.07\text{‰} \pm 0.23$ . Statistical analysis and data visualisation were carried out using R v.4.4.1 (R core team 2024), including the ggstatsplot package (Patil 2021).

ZooMS was carried out on all sheep, goats and sheep/goats using a subsample (c. 1mg) of extracted collagen, which was aimed at differentiating the two species. Analyses followed the procedure outlined in Welker *et al.* (2015) from the AmBic incubation step. Each sample was added 200µL of 50mM ammonium bicarbonate (AmBic) and incubated at 65°C for one hour to solubilise collagen. After centrifugation, 100µL of the supernatant was transferred into new microfuge tubes and digested overnight (c. 18 hours) with 1µL of trypsin solution at 37°C. Digestion was stopped with 1µL 5% v/v trifluoroacetic acid (TFA). Resulting peptides were purified using C18 resin ZipTip pipette tips and eluted into 100µL of 0.1% TFA in 50:50 acetonitrile:water. Samples were spotted in triplicate along calibration standards on Bruker steel plates, mixing 1µL of sample and 1µL of matrix ( $\alpha$ -cyano-hydroxycinnamic acid), and they were run on a Bruker Ultraflex III MALDI-ToF-MS (matrix-assisted laser desorption ionisation-time of flight mass spectrometer). Using the software mMass (Strohalm *et al.* 2010), spectra were averaged and cropped, keeping the range 800–3500m/z. Peaks were picked using a s/n ratio of 4. The resulting spectra were compared to published markers to discriminate between sheep and goat (Buckley *et al.* 2010).

## Results

Results for all samples reported here met collagen quality criteria for %C, %N and C:N (Ambrose 1990; Van Klinken 1999), including the conservative cutoffs for C:N following Guiry and Szpak (2021). A breakdown of all isotopic data, including quality controls, is provided open access in the IsoArch database (Alexander *et al.* 2025).

### Terrestrial animals

Animal data is summarised in Table 8.4. Excluding fish, which will be discussed separately, terrestrial species display a broad isotopic spread, with overall ranges of 6.5‰ for  $\delta^{13}\text{C}$  and 8.3‰ for  $\delta^{15}\text{N}$ . Mean  $\delta^{13}\text{C}$  values for most terrestrial animals generally cluster between -21‰ and -19‰, consistent with diets predominantly derived from C<sub>3</sub> vegetation. However, a single chicken from Alcázar Real de Guadalajara ( $\delta^{13}\text{C}$  -15.8‰) and a cattle sample from castle of Zorita de los Canes ( $\delta^{13}\text{C}$  -16.1‰) show distinctly fewer negative values, suggesting significant consumption of C<sub>4</sub> plants.  $\delta^{15}\text{N}$  values exhibit high variability across species, reflecting their differing trophic levels, encompassing herbivores and omnivores. However, wide ranges within herbivore species are also seen, up to 6‰ for sheep at Alcázar

Table 8.4. Summary statistics of carbon and nitrogen stable isotope ratios of animal samples, grouped by site. Standard deviations ( $1\sigma$ ) are provided where  $n > 2$ . ZC includes the animal samples from Pérez-Ramallo et al. (2024)

| Site                         | Species    | N  | $\delta^{13}\text{C}$ (‰)<br>Mean $\pm 1\sigma$ | Min.  | Max.  | Range | $\delta^{15}\text{N}$ (‰)<br>Mean $\pm 1\sigma$ | Min. | Max. | Range |
|------------------------------|------------|----|-------------------------------------------------|-------|-------|-------|-------------------------------------------------|------|------|-------|
| PG<br>10th c.                | Cattle     | 3  | -19.9 $\pm$ 0.3                                 | -20.1 | -19.6 | 0.5   | 7.0 $\pm$ 1.3                                   | 5.4  | 7.9  | 2.5   |
|                              | Sheep      | 16 | -20.0 $\pm$ 0.8                                 | -21.9 | -18.9 | 3.1   | 6.8 $\pm$ 1.4                                   | 4.3  | 9.5  | 5.2   |
|                              | Goat       | 2  | -19.3                                           | -19.4 | -19.1 | 0.3   | 6.3                                             | 5.9  | 6.7  | 0.8   |
|                              | Rabbit     | 1  | -20.9                                           |       |       |       | 4.6                                             |      |      |       |
|                              | Chicken    | 3  | -19.8 $\pm$ 0.5                                 | -20.2 | -19.2 | 0.9   | 6.3 $\pm$ 0.5                                   | 5.9  | 6.9  | 1.0   |
| ZC<br>13th–15th c.           | Cattle     | 5  | -19.3 $\pm$ 1.9                                 | -20.5 | -16.1 | 4.4   | 6.8 $\pm$ 0.7                                   | 5.9  | 7.5  | 1.6   |
|                              | Sheep      | 4  | -21.0 $\pm$ 0.3                                 | -21.4 | -20.7 | 0.7   | 7.1 $\pm$ 1.7                                   | 5.7  | 9.0  | 3.3   |
|                              | Sheep/Goat | 6  | -20.6 $\pm$ 0.4                                 | -21.3 | -20.0 | 1.3   | 6.0 $\pm$ 1.0                                   | 5.4  | 7.8  | 2.4   |
|                              | Pig        | 1  | -19.7                                           |       |       |       | 7.7                                             |      |      |       |
|                              | Rabbit     | 5  | -21.6 $\pm$ 0.3                                 | -22.0 | -21.2 | 0.8   | 4.1 $\pm$ 0.7                                   | 3.3  | 5.2  | 1.9   |
|                              | Chicken    | 3  | -19.9 $\pm$ 0.2                                 | -20.0 | -19.7 | 0.3   | 7.5 $\pm$ 0.5                                   | 7.1  | 8.1  | 1.0   |
| ALC<br>Mid-13th–14th c.      | Cattle     | 7  | -20.4 $\pm$ 0.6                                 | -21.0 | -19.6 | 1.4   | 6.6 $\pm$ 1.1                                   | 5.1  | 8.1  | 3.0   |
|                              | Sheep      | 50 | -20.5 $\pm$ 0.8                                 | -21.9 | -18.3 | 3.6   | 6.9 $\pm$ 1.0                                   | 4.3  | 10.3 | 6.0   |
|                              | Goat       | 20 | -19.9 $\pm$ 0.4                                 | -20.8 | -19.1 | 1.8   | 5.1 $\pm$ 0.8                                   | 3.4  | 6.5  | 3.1   |
|                              | Pig        | 11 | -20.1 $\pm$ 0.5                                 | -20.8 | -19.3 | 1.5   | 7.3 $\pm$ 1.9                                   | 4.8  | 11.0 | 6.2   |
|                              | Dog        | 1  | -18.1                                           |       |       |       | 9.0                                             |      |      |       |
|                              | Rabbit     | 2  | -21.7                                           | -22.3 | -21.1 | 1.2   | 5.7                                             | 5.1  | 6.2  | 1.1   |
|                              | Chicken    | 17 | -19.0 $\pm$ 1.0                                 | -20.0 | -15.8 | 4.2   | 8.9 $\pm$ 1.0                                   | 7.2  | 11.2 | 4.1   |
|                              | Goose      | 4  | -20.0 $\pm$ 0.9                                 | -20.7 | -18.7 | 2.0   | 9.8 $\pm$ 1.4                                   | 8.7  | 11.6 | 3.0   |
|                              | Partridge  | 2  | -19.4                                           | -19.8 | -19.1 | 0.8   | 6.3                                             | 4.2  | 8.4  | 4.3   |
|                              | Pigeon     | 1  | -19.8                                           |       |       |       | 7.4                                             |      |      |       |
|                              | Fish       | 9  | -12.3 $\pm$ 0.4                                 | -12.6 | -11.6 | 1.0   | 12.0 $\pm$ 1.3                                  | 10.3 | 13.5 | 3.2   |
| AT<br>Mid-14th–early 15th c. | Cattle     | 1  | -20.4                                           |       |       |       | 5.6                                             |      |      |       |
|                              | Sheep      | 1  | -19.8                                           |       |       |       | 7.6                                             |      |      |       |
|                              | Goat       | 7  | -20.1 $\pm$ 0.4                                 | -20.5 | -19.3 | 1.2   | 5.4 $\pm$ 1.1                                   | 4.1  | 7.0  | 2.8   |
|                              | Sheep/Goat | 1  | -20.4                                           |       |       |       | 6.7                                             |      |      |       |

Real de Guadalajara, indicating the isotopic diversity in the plants and fodder they habitually consumed. Notably, some herbivorous species, particularly sheep, exhibit higher  $\delta^{15}\text{N}$  values than might be conventionally expected for their trophic niche (reaching up to 10.3‰ at Alcázar Real de Guadalajara). Intra-species variation in  $\delta^{15}\text{N}$  is also considerable, most pronounced in sheep (maximum range of 6.0‰) and pigs (maximum range of 6.2‰). Further exploration of these and other trends is detailed below.

### Intrasite comparison: Alcázar Real de Guadalajara

The late medieval Christian site of Alcázar Real de Guadalajara presents the largest and most diverse animal dataset

(terrestrial fauna,  $n = 115$ ), enabling an in-depth exploration of animal diets at this site. Plate 8.2 presents the isotopic data for all mammals and birds from this assemblage. Herbivores and omnivores are differentiated mainly by their nitrogen isotope values, although pigs possess a wide range in  $\delta^{15}\text{N}$  values congruent with a mixture of herbivorous and omnivorous feeding practices. The data for common domesticates with more than four samples per species (i.e. cattle, sheep, goat, pig, chicken) are further compared in Figure 8.1. This comparison further highlights some striking differences in isotopic values with statistically significant differences for both  $\delta^{13}\text{C}$  (Kruskal-Wallis  $\chi^2(4) = 35.81$ ,  $p < 0.001$ ) and  $\delta^{15}\text{N}$  (Kruskal-Wallis  $\chi^2(4) = 55.75$ ,  $p < 0.001$ ) between species. Dunn's *post hoc* pairwise comparisons indicate that these differences are,



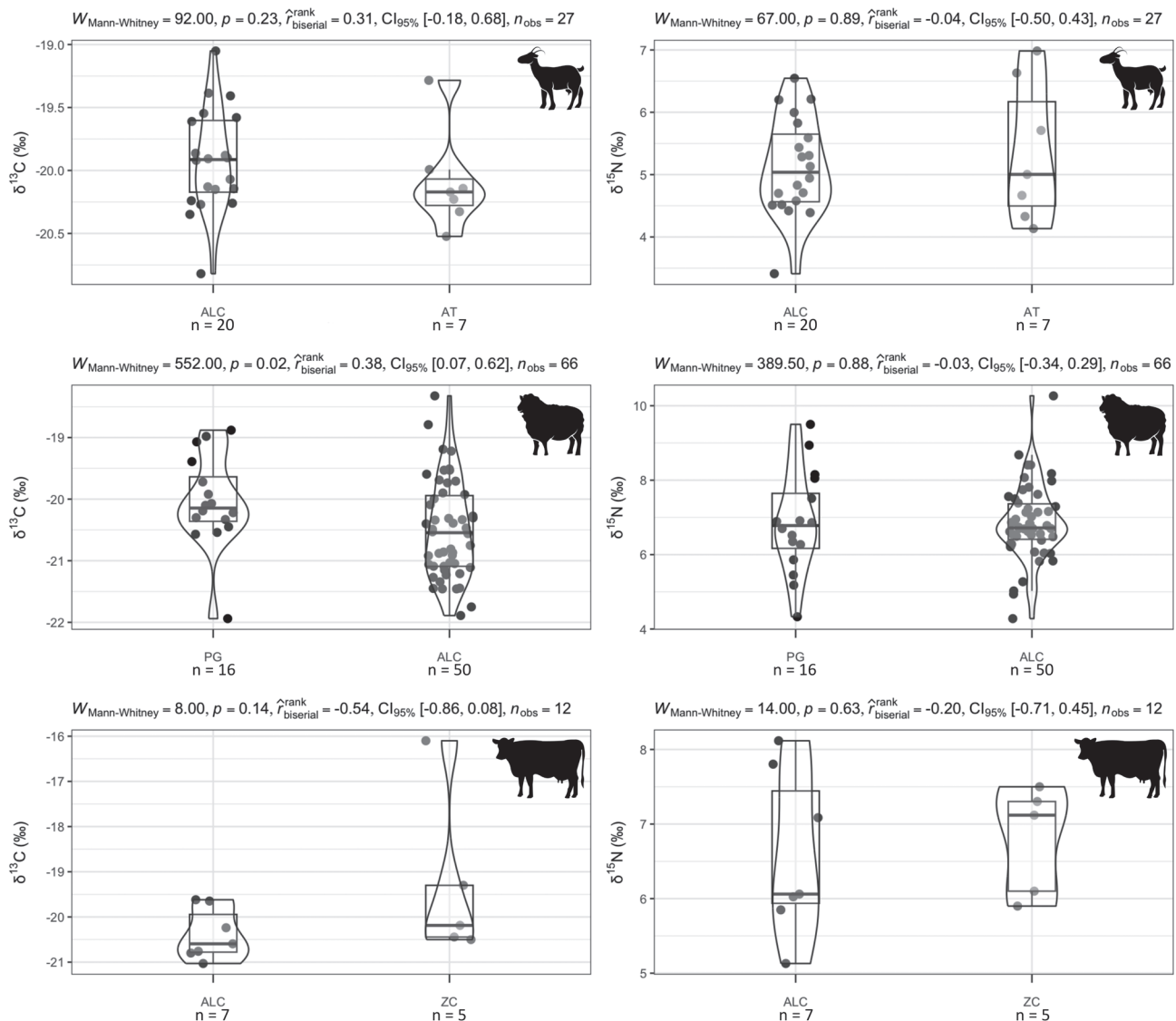


Fig. 8.2. Carbon (left) and nitrogen (right) isotopic ratios for goats (top), sheep (middle) and cattle (bottom) compared between sites with > 4 data points: Alcázar Real de Guadalajara (ALC), Atienza Jewish quarter (AT), Palacio de los Guzmán (PG), Castle of Zorita de los Canes (ZC)

as expected, driven mainly by chickens possessing higher  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values than other species. Conversely, pigs, another omnivore, are not differentiated in their isotopic values compared to herbivores, except goats, which further highlights the range of feeding/husbandry practices in use for this species. Notably, sheep and goats are statistically significantly different in their values for both isotopes, with goats generally exhibiting higher  $\delta^{13}\text{C}$  and lower  $\delta^{15}\text{N}$  than sheep.

Alcázar Real de Guadalajara is the only site from which we analysed geese, a dog and a pigeon, all of which plot largely in the same isotopic range as chickens (Fig. 8.2),

although geese tend towards slightly lower  $\delta^{13}\text{C}$  values. Two additional partridges plot with similar  $\delta^{13}\text{C}$  but divergent  $\delta^{15}\text{N}$  values, one with a higher value in keeping with chickens (8.4‰) while the other plots with some of the lowest herbivore values (4.2‰).

### Comparison of terrestrial animals between sites

The remaining three sites are represented by smaller animal datasets with differing species representation (Plate 8.3). On the whole, the faunal assemblage from the castle of Zorita de los Canes shows greater variability than

both the Palacio de los Guzmán and the Atienza Jewish quarter. There were more sheep analysed at Palacio de los Guzmán and more goats at the Atienza Jewish quarter, which leads to slightly different ranges for herbivore  $\delta^{15}\text{N}$  at these sites, as sheep again possess higher  $\delta^{15}\text{N}$  values than goats between these sites. Sheep, goat and cattle represented by at least five samples from the same site were directly compared in Fig. 8.2. Goats from the Alcázar Real de Guadalajara and the Atienza Jewish quarter have similar ranges for both  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ . Sheep from the earlier Islamic Palacio de los Guzmán and the later Christian Alcázar Real de Guadalajara showed similar  $\delta^{15}\text{N}$  ranges. However, their  $\delta^{13}\text{C}$  values differed significantly (Mann-Whitney  $W = 552$ ,  $p = 0.020$ , Fig. 8.2), with those from Palacio de los Guzmán consistently clustering at the higher end of the range observed at Alcázar Real. This patterning could hint at sheep being pastured in a more specific environment in the earlier period and the exploitation of a larger environmental catchment area at the elite

Alcázar Real de Guadalajara. The sheep from castle of Zorita de los Canes, contemporaneous with Alcázar Real de Guadalajara (Table 8.4, not included in Fig. 8.2, due to sample size  $< 5$ ), possess a more restricted range of  $\delta^{13}\text{C}$  values (0.7‰) that sit within the overall variability in carbon stable isotope ratios observed at Alcázar Real de Guadalajara and Palacio de los Guzmán. The small number of samples from Zorita de los Canes ( $n = 4$ ) precludes going too far with inference, but this could suggest that the supply to this castle inhabited by the Calatrava military order may have been more geographically constrained than at urban sites. Cattle from all sites exhibit a similar range of isotopic values, bar one outlier from castle of Zorita de los Canes with a high  $\delta^{13}\text{C}$  value clearly differentiated in Plate 8.3 and Fig. 8.2, with a significant input of  $\text{C}_4$  plants to their diet.

The central tendencies of chicken  $\delta^{13}\text{C}$  values are similar across all sites, indicating consistently  $\text{C}_3$ -based diets, except one outlier chicken at Alcázar Real de Guadalajara

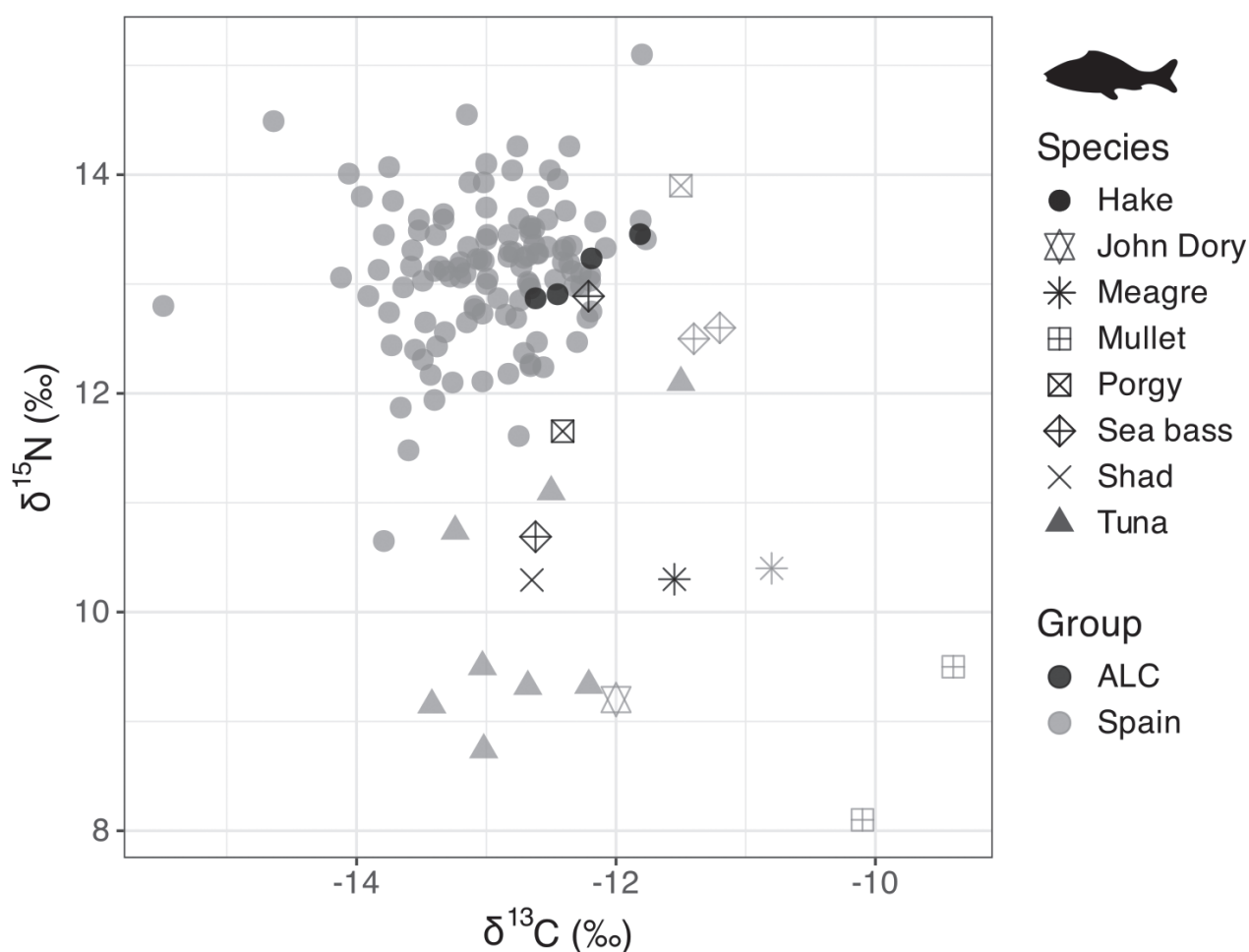


Fig. 8.3. Carbon and nitrogen stable isotope ratios of fish samples from Alcázar Real de Guadalajara (ALC), grouped by species, plotted against published values of medieval fish from Iberia from Alexander et al. (2015), López-Costas and Müldner (2016, 2019), Llorente-Rodríguez et al. (2022), Pérez-Ramallo et al. (2022)

with a significantly higher  $\delta^{13}\text{C}$  value indicative of a marked  $\text{C}_4$  contribution to the diet. Chickens from Palacio de los Guzmán ( $n = 3$ ) and castle of Zorita de los Canes ( $n = 3$ ) fall just below or in the lower range of  $\delta^{15}\text{N}$  exhibited by Alcázar Real de Guadalajara. This pattern may hint at less intensive management of chickens at those sites, but small sample sizes hinder interpretation. Rabbits have very similar  $\delta^{13}\text{C}$  values across the three sites from which they

Table 8.5. Summary statistics of carbon and nitrogen stable isotope ratios of fish samples from Alcázar Real de Guadalajara (ALC), grouped by species. Standard deviations ( $1\sigma$ ) are provided where  $n > 2$

| Species                      |           | $N$ | $\delta^{13}\text{C}$ (‰)<br>Mean $\pm 1\sigma$ | $\delta^{15}\text{N}$ (‰)<br>Mean $\pm 1\sigma$ |
|------------------------------|-----------|-----|-------------------------------------------------|-------------------------------------------------|
| <i>Alosa</i> sp.             | Shad      | 1   | -12.6                                           | 10.3                                            |
| <i>Argyrosomus regius</i>    | Meagre    | 1   | -11.6                                           | 10.3                                            |
| <i>Dicentrarchus</i> cf.     | Sea bass  | 2   | -12.4                                           | 11.8                                            |
| <i>Merluccius merluccius</i> | Hake      | 4   | -12.3 $\pm$ 0.4                                 | 13.1 $\pm$ 0.3                                  |
| <i>Pagellus</i> cf.          | Sea bream | 1   | -12.4                                           | 11.7                                            |

were analysed; however,  $\delta^{15}\text{N}$  values show a subtle increase at Alcázar Real de Guadalajara (mean 5.7‰,  $n = 2$ ) when compared to Palacio de los Guzmán (4.6‰,  $n = 1$ ) and castle of Zorita de los Canes (mean 4.1‰,  $n = 5$ ) which might reflect microscale variation in the environment in which these wild species lived (Somerville *et al.* 2018).

### Fish

Fish from the Alcázar Real de Guadalajara were analysed to provide an isotopic signal for the typical fish available in the area of Guadalajara, although note that they all derive from a high-status context. Katrien Dierickx, a former PhD student at the University of York, carried out fish identifications. Summary data for fish are broken down by species in Table 8.5 and plotted alongside other published fish from medieval Spain in Fig. 8.3. All fish species were marine, which is reflected in their high values for both  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ . However, there is a great spread in nitrogen isotope ratios, with hake systematically showing the highest  $\delta^{15}\text{N}$  values in this dataset.

### Human diet

A total of 45 human adults were analysed as part of the Landscapes of (Re)Conquest project. These new results have

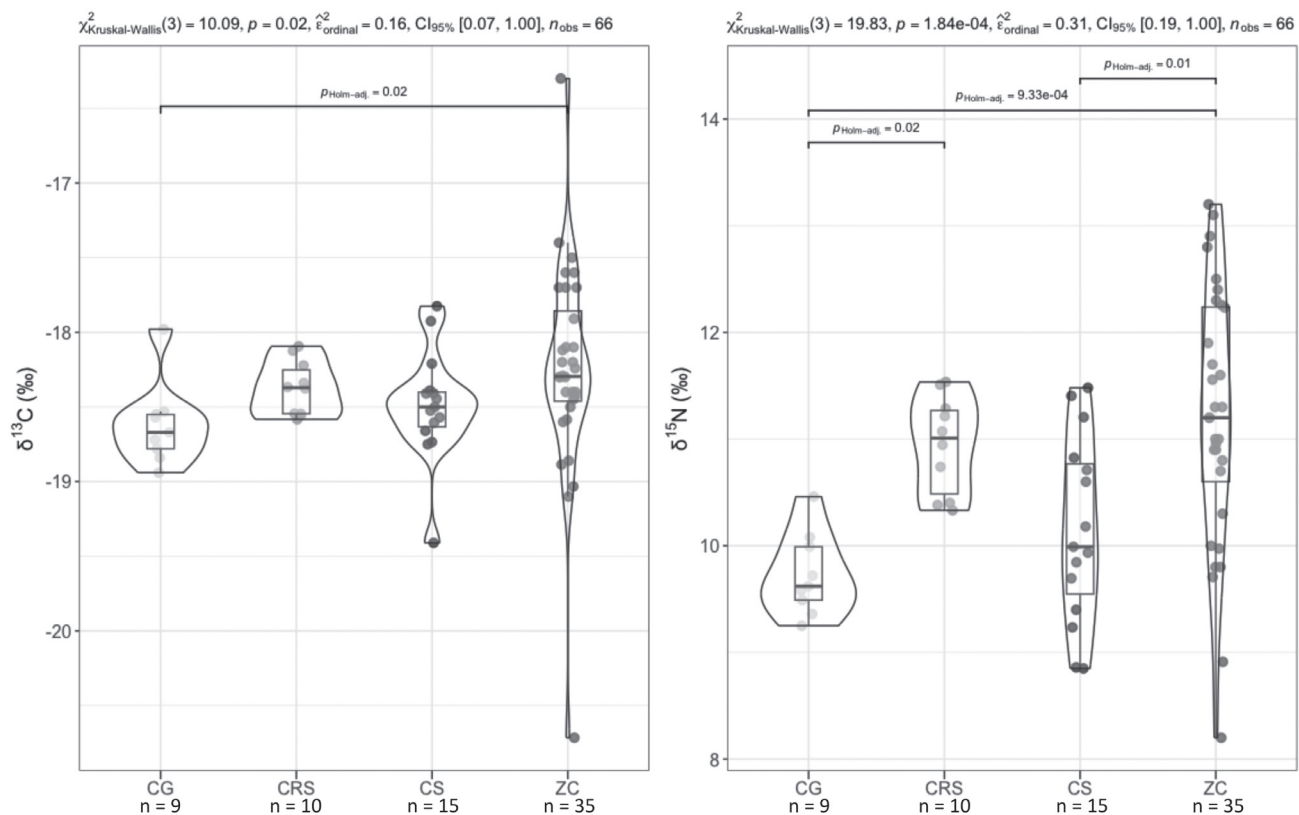


Fig. 8.4. Carbon (left) and nitrogen (right) isotopic ratios of the human samples grouped by sites. Due to the lack of isotopic differentiation, individuals from both periods of CG were considered together. Bars indicate statistically significant Kruskal-Wallis tests with Dunn's post hoc pairwise comparisons and associated  $p$  values (Bonferroni adjusted)



Table 8.6. Summary statistics of carbon and nitrogen stable isotope ratios of human samples, grouped by sites. Note the two periods represented by CG. ZC includes the adult human individuals from Pérez-Ramallo *et al.* (2024)

| Site | Chronology         | N  | $\delta^{13}\text{C}$ (‰)<br>Mean $\pm$ 1 $\sigma$ | Min.  | Max.  | Range | $\delta^{15}\text{N}$ (‰)<br>Mean $\pm$ 1 $\sigma$ | Min. | Max. | Range |
|------|--------------------|----|----------------------------------------------------|-------|-------|-------|----------------------------------------------------|------|------|-------|
| CS   | Late 10th–13th C.  | 15 | -18.5 $\pm$ 0.4                                    | -19.4 | -17.8 | 1.6   | 10.1 $\pm$ 0.9                                     | 8.9  | 11.5 | 2.6   |
| CG   | 10th–11th C.       | 7  | -18.7 $\pm$ 0.2                                    | -18.9 | -18.5 | 0.4   | 9.6 $\pm$ 0.4                                      | 9.3  | 10.5 | 1.2   |
|      | 15th–early 16th C. | 2  | -18.4                                              | -18.8 | -18.0 | 0.8   | 10.0                                               | 10.0 | 10.1 | 0.1   |
| ZC   | 13th–15th C.       | 32 | -18.2 $\pm$ 0.7                                    | -20.7 | -16.3 | 4.4   | 11.2 $\pm$ 1.2                                     | 8.2  | 13.2 | 5.0   |
| CRS  | 14th–15th C.       | 10 | -18.4 $\pm$ 0.2                                    | -18.6 | -18.1 | 0.5   | 10.9 $\pm$ 0.5                                     | 10.3 | 11.5 | 1.2   |

been combined with previously published human data for 21 individuals from the castle of Zorita de los Canes (Pérez-Ramallo *et al.* 2024), forming a comprehensive dataset. The combined average data from the femur and the rib were used for the Cathedral of Sigüenza population; see the separate section below. Summary statistics, broken down by site, are presented in Table 8.6. Plate 8.4 illustrates the distribution of these human samples relative to combined animal data from all sites in this chapter. Fig. 8.4 further compares the isotopic values for the human populations between sites. Although individuals from the Cemetery of Guadalajara dated to two different periods, the two individuals from the 15th to early 16th centuries have isotopic values within the range of individuals from the earlier 10th to 11th centuries (Table 8.6). Therefore, they have been combined to form one population for plotting and statistical analysis.

Combined human isotopic values across all sites ranged between -20.7‰ to -16.3‰ for  $\delta^{13}\text{C}$  (range 4.4‰) and 8.2‰ to 13.2‰ for  $\delta^{15}\text{N}$  (range 5‰). These values primarily indicate a diet based on  $\text{C}_3$  resources. However, a small proportion of individuals displayed  $\delta^{13}\text{C}$  values greater than -18‰, suggesting some input of marine protein and/or  $\text{C}_4$  plants (Ganzarolli *et al.* 2018), either directly or indirectly through the consumption of  $\text{C}_4$ -fed animal protein. The majority of these individuals with higher  $\delta^{13}\text{C}$  derive from the castle of Zorita de los Canes, a site where a  $\text{C}_4$ -fed cattle specimen was also identified. The distribution of human  $\delta^{15}\text{N}$  values when compared with local animal baselines indicates highly variable animal protein intake among individuals, again with castle of Zorita de los Canes displaying the widest range, from the extremes of a human plotting amongst herbivores at 8.2‰ with little input of low trophic level animal protein in their diet to another individual with an  $\delta^{15}\text{N}$  value of 13.2‰ positioning them within one trophic level above local omnivores (Bocherens and Drucker 2003). Such dietary differentiation may be influenced by factors such as geographical mobility or the consumption of  $^{15}\text{N}$ -enriched foods, such as high trophic level omnivore protein (meat, eggs, etc) and fish (marine or freshwater). Freshwater fish, not available for analysis here, often exhibit high  $\delta^{15}\text{N}$  values and variable, but typically lower, terrestrially influenced  $\delta^{13}\text{C}$  values (Guiry 2019). Equifinality in bulk  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$

values for marine and  $\text{C}_4$ -fed animal protein in the Mediterranean, however, means identifying  $\text{C}_4$  vs. marine in human diets is challenging (Alexander *et al.* 2015; López-Costas and Müldner 2019).

Most individuals (10 out of 11) from the castle of Zorita de los Canes analysed within the Landscapes of (Re)Conquest project sit within the range of values for adults with acceptable collagen quality controls previously published from this site ( $\delta^{13}\text{C}$ : min -19.1‰, max -16.3‰,  $\delta^{15}\text{N}$ : min 9.8‰, max 13.2‰; Pérez-Ramallo *et al.* 2024) with no particular clustering. Two individuals, ZC\_T03 and ZC\_UE3, possess slightly lower  $\delta^{15}\text{N}$  values (8.2‰ and 8.9‰, respectively) compared to the absolute range. Additionally, ZC\_T03 is a particular outlier, as its  $\delta^{13}\text{C}$  value of -20.7‰ also falls outside the range for the published population. Individual ZC\_T03's  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values are 3.5 and 2.5 standard deviations away from the means for the respective stable isotopes for the entire combined population (this study and Pérez-Ramallo *et al.* 2024). ZC\_T03 reveals a new dietary extreme that suggests they could either be a non-local from an area with a differing isotopic baseline, or they consumed very little in the way of animal protein, in contrast to others from the same site.

Statistical comparison of human isotopic values between the populations (Fig. 8.4) revealed significant differences across sites for both  $\delta^{13}\text{C}$  ( $H(3) = 10.09$ ,  $p = 0.020$ ) and  $\delta^{15}\text{N}$  ( $H(3) = 19.83$ ,  $p < 0.001$ ). These distinctions were primarily driven by the broad dispersion observed for both isotopes at the castle of Zorita de los Canes, a population with particular status as members and affiliates of a military order. Dunn's *post hoc* pairwise comparisons further identified a statistically significant difference in  $\delta^{15}\text{N}$  values between the Cemetery of Guadalajara and the late medieval burials from Campus de las Cristinas. The  $\delta^{15}\text{N}$  values of these two groups exhibited almost no overlap, with the latter consistently showing higher  $\delta^{15}\text{N}$  values. Interpreting this observed pattern based on chronology or religious affiliation is challenging. This is because the small sample from the Cemetery of Guadalajara ( $n = 9$ ), which comprises both seven 10th- to 11th-century Islamic individuals and two 15th- to 16th-century Christian individuals, displays similar isotopic values despite these internal

Table 8.7. Comparison of carbon and nitrogen stable isotope ratios of rib and femur samples from the human population of the Cathedral of Sigüenza.  $\bar{X}$  represents the mean between rib and femur measurements.  $\Delta$  represents the difference between rib and femur values. \*See Hyland et al. (2022) for Euclidean distance

| Individual | Rib<br>$\delta^{13}\text{C}$ (‰) | Femur<br>$\delta^{13}\text{C}$ (‰) | $\bar{X}$ $\delta^{13}\text{C}$ | $\Delta^{13}\text{C}$ | Rib<br>$\delta^{15}\text{N}$ (‰) | Femur<br>$\delta^{15}\text{N}$ (‰) | $\bar{X}$ $\delta^{15}\text{N}$ | $\Delta^{15}\text{N}$ | Euclidean distance* |
|------------|----------------------------------|------------------------------------|---------------------------------|-----------------------|----------------------------------|------------------------------------|---------------------------------|-----------------------|---------------------|
| CS 03      | -18.5                            | -18.7                              | -18.6                           | -0.3                  | 10.1                             | 9.6                                | 9.8                             | -0.5                  | 0.54                |
| CS 05      | -18.3                            | -18.6                              | -18.4                           | -0.3                  | 10.6                             | 11.0                               | 10.8                            | 0.4                   | 0.50                |
| CS 06      | -18.4                            | -18.5                              | -18.4                           | -0.1                  | 11.3                             | 11.5                               | 11.4                            | 0.1                   | 0.22                |
| CS 07      | -17.7                            | -17.9                              | -17.8                           | -0.2                  | 9.4                              | 9.1                                | 9.2                             | -0.3                  | 0.36                |
| CS 08      | -18.8                            | -18.7                              | -18.7                           | 0.1                   | 10.0                             | 9.8                                | 9.9                             | -0.2                  | 0.22                |
| CS 09      | -19.4                            | -19.5                              | -19.4                           | -0.1                  | 9.0                              | 8.8                                | 8.9                             | -0.2                  | 0.22                |
| CS 10      | -18.3                            | -17.6                              | -17.9                           | 0.6                   | 9.9                              | 10.1                               | 10.0                            | 0.1                   | 0.73                |
| CS 11      | -18.4                            | -18.5                              | -18.4                           | -0.1                  | 10.1                             | 9.3                                | 9.7                             | -0.7                  | 0.81                |
| CS 12      | -18.2                            | -18.8                              | -18.5                           | -0.6                  | 10.6                             | 9.8                                | 10.2                            | -0.8                  | 1.00                |
| CS 13      | -18.5                            | -18.6                              | -18.5                           | -0.1                  | 11.3                             | 11.1                               | 11.2                            | -0.3                  | 0.22                |

chronological and religious differences. Consequently, the limited sample sizes likely preclude a clear interpretation of the two cemetery populations from the urban area of Guadalajara itself.

Dietary comparisons between sexes are limited due to the small number of osteologically sexed individuals; however, the available data are plotted in Plate 8.5. Small sample sizes preclude statistical comparison within sites, but it is clear that at those sites where more than three individuals of each sex are present, i.e. Campus de la Cristinas and Cathedral of Sigüenza (Table 8.1), males and females plot with similar ranges for  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ , indicating isotopically similar diets.

#### Human diet through life: Cathedral of Sigüenza

Both femur and rib were sampled from ten individuals at the Cathedral of Sigüenza (Table 8.7) to explore intra-skeletal variation that may reveal dietary change through life following the assumption that the rib has a faster turnover than the femur and will, therefore, reflect the most recent diet (Cox and Sealy 1997; Hedges *et al.* 2007; Fahy *et al.* 2017). A number of studies have explored dietary change through life using this approach (Pollard *et al.* 2012; Lamb *et al.* 2014; Amaro *et al.* 2024). At the Cathedral of Sigüenza, on average, femur and rib isotopic values differed by  $-0.1 \pm 0.3\text{‰}$  ( $1\sigma$ ) for  $\delta^{13}\text{C}$  and  $-0.2 \pm 0.4\text{‰}$  ( $1\sigma$ ) for  $\delta^{15}\text{N}$  and no difference was greater than  $1\text{‰}$  for either  $\delta^{13}\text{C}$  or  $\delta^{15}\text{N}$  in any individual, the minimum meaningful difference between isotopic values (Pestle *et al.* 2014; Vaiglova *et al.* 2023). The highest value of Euclidean distance in bivariate ( $\delta^{13}\text{C}$ ,  $\delta^{15}\text{N}$ ) space (distance between two points in isotopic space) is  $1\text{‰}$ , and the majority are significantly lower than the  $1.5\text{‰}$  recommended to identify an isotopically distinct specimen or significantly different diet (Hyland *et al.* 2022).

Paired sample t-tests revealed no statistically significant difference between the ribs and femurs for either  $\delta^{13}\text{C}$  ( $t = 0.86$ ,  $df = 9$ ,  $p = 0.400$ ) or  $\delta^{15}\text{N}$  ( $t = 0.17$ ,  $df = 9$ ,  $p = 0.120$ ). This indicates that either diet throughout life did not change appreciably, at least isotopically, among these individuals or that rib and femur represent diet over similar time spans (Quinn 2024). The combined average data from both the femur and the rib were therefore used to explore diet in the Cathedral of Sigüenza population.

## Discussion

### Trends in the main domesticates: sheep, goat and cattle

The range of  $\delta^{15}\text{N}$  values demonstrated by herbivores, particularly sheep, was notable, indicating that they were habitually pastured on and/or were foddered on plants from isotopically diverse locations. Sheep consistently exhibited some of the highest  $\delta^{15}\text{N}$  values among herbivores, occasionally matching those of omnivores such as chickens (e.g.  $> 8\text{‰}$ ), underscoring the complexity in interpreting nitrogen isotope baselines, where geospatial variations in plant  $\delta^{15}\text{N}$  values can be caused by a range of factors (Szpak 2014). Elevated  $\delta^{15}\text{N}$  values in herbivores may be the result of habitual consumption of plants growing in areas with, e.g., low moisture availability/aridity (including salinity, mentioned below), high grazing intensity and anthropogenic or agricultural influence (Bogaard *et al.* 2007; Fraser *et al.* 2011; Szpak 2014). Historical evidence from al-Andalus indicates that plant agriculture and livestock management were intimately intertwined. Livestock commonly grazed on stubble in crop fields, simultaneously providing fertilisation through their dung (García García and Moreno García 2018). Historical accounts from the later Nasrid period in

Andalucía indicate that livestock were often corralled near settlements to facilitate manure collection (García García and Moreno García 2018), which is also hypothesised for the earlier Andalusi period elsewhere (Jiménez-Castillo *et al.* 2025) and attested by geoarchaeological analyses from sites in this project (Chapter 5). Such practices would lead to increased  $\delta^{15}\text{N}$  values in their diet due to the consumption of grasses growing in areas of higher grazing intensity and anthropogenically influenced soils with a heavier application of organic refuse and manure (Hedges *et al.* 2005; Szpak 2014).

While elevated  $\delta^{15}\text{N}$  values can also be a physiological factor observed in suckling animals whose nitrogen values are typically around 2–3‰ higher than those of their mothers (Fuller *et al.* 2006), this is unlikely to be the primary explanation for the high nitrogen values for sheep recorded here. The majority of caprines sampled from Alcázar Real de Guadalajara, for example, were slaughtered during their second to third year at optimum meat yield (Chapter 7), thus being well past the suckling stage, assuming lambs were weaned at around 5 months, similar to England during the high medieval period (Stone 2003). Moreover, very young suckling animals (identified through fusion data) were intentionally excluded from isotopic analysis. This interpretation is further supported by studies on modern sheep, where isotopic data from bone collagen of animals slaughtered after 8–9 months have not demonstrated retention of elevated  $\delta^{15}\text{N}$  values attributable to suckling (Doherty *et al.* 2022). Given the predominance of younger slaughter ages at Alcázar Real de Guadalajara, combined with some of the highest  $\delta^{15}\text{N}$  values for sheep at this site, it may be postulated that those sheep destined for comparatively younger slaughter ages for the highest meat yields may have been managed in closer proximity to settlements and foddered with agricultural products and byproducts.

Focusing on carbon isotopes, sheep from Palacio de los Guzmán in particular displayed  $\delta^{13}\text{C}$  values distinctly centred at the higher end of the range observed across the analysed sheep populations. The majority of these values clustered around -20‰ (barring one potential outlier around -22‰), conceivably reflecting supply from a localised area and grazing on drier pastures with lower water availability (although this could also potentially cause lower  $\delta^{15}\text{N}$  values, not seen here). The contemporary climate of the region is classified as arid according to the Köppen-Geiger system (Beck *et al.* 2018). In such arid conditions, water availability exerts a greater influence on plant  $\delta^{13}\text{C}$  values than nutrient and light availability (Wallace *et al.* 2013). However, other factors that could drive plant  $\delta^{13}\text{C}$  values higher, such as soil salinity (which can also lead to soil  $^{15}\text{N}$  enrichment, Ambrose 1991; Heaton 1999), could also conceivably affect these isotopic values, especially given the presence of significant medieval saltworks and saltmarshes in the basin of the Salado river near Sigüenza (Malpica *et al.*

2011; García-Contreras Ruiz 2022). These factors are relevant considerations for interpreting some of the highest  $\delta^{13}\text{C}$  values throughout the entire animal dataset for the region. In contrast, sheep from the later Alcázar Real de Guadalajara exhibited a wider range of  $\delta^{13}\text{C}$  values. This suggests access to a broader catchment area encompassing a greater variety of environmental conditions beyond the immediate locality, consistent with the provisioning of livestock to an elite castle population. This tallies well with the large type of sheep recorded at the site, which were potentially sourced from a specialist centralised supply (Chapter 7).

The isotopic data reveal overlapping but distinct dietary patterns for sheep and goats, suggesting differing isotopic niches. These distinctions may be attributed to physiological differences, dietary preferences (e.g. sheep for graze, goats for browse), or deliberate differential management practices. Specifically, goats across all sites tend towards lower  $\delta^{15}\text{N}$  values than sheep, which may indicate a more extensive rather than intensive husbandry regime for this species, perhaps keeping them further from agricultural land or consumption of agricultural byproducts (Szpak 2014). Physiological differences in  $\delta^{15}\text{N}$  driven by water metabolism between these species are unlikely, as diet rather than water availability drives the  $\delta^{15}\text{N}$  values of herbivore tissues (Hartman 2011). Regarding  $\delta^{13}\text{C}$ , goats consistently exhibit fewer negative values than sheep across all sites. While  $\delta^{13}\text{C}$  differences between caprines can sometimes reflect differentiation between  $\text{C}_3$  browse and  $\text{C}_4$  graze (e.g. sheep primarily grazing  $\text{C}_4$  grasses; Balasse and Ambrose 2005), naturally occurring  $\text{C}_4$  species are a minority in Spain (Pyankov *et al.* 2010). Topographic effects on the isotopic values for plants in arid Eastern Mediterranean environments, in line with the pattern of goat values here, have been reported, with plants growing on more exposed slopes and ridges demonstrating higher  $\delta^{13}\text{C}$  and lower  $\delta^{15}\text{N}$  values due to localised dynamics in water availability (Hartman and Danin 2010). The applicability of this phenomenon to the Guadalajara environment warrants further research; however, a plausible interpretation at this stage could be that goats, being more drought-tolerant than sheep (Silanikove 2000), were perhaps targeted for subsistence in drier/harsher environments.

In prehistoric Mediterranean contexts where caprines played an important role in animal husbandry, sheep and goats have often exhibited similar isotopic values, leading to the hypothesis that they were herded together, for example, in Anatolia (Pearson *et al.* 2007; Irvine *et al.* 2025). Other studies suggest that flock size is a factor; when kept in large numbers, sheep and goats are more likely to be herded separately in optimal habitats (Shipley 2001; Vaiglova *et al.* 2014). Vaiglova *et al.* (2014) observed similar trends in Neolithic caprine data from Greece to those identified here for medieval Guadalajara, although with smaller sample sizes. In their findings, where discernible differences existed between the two species, sheep possessed more negative  $\delta^{13}\text{C}$



values (interpreted as sheep subsisting on grasses growing on wetter soils) and higher  $\delta^{15}\text{N}$  values (possibly related to the choice of plants and plant parts). This emerging trend of divergent isotopic values for caprines in Mediterranean contexts merits additional investigation. The patterns observed in Guadalajara suggest that sheep and goats were unlikely to have been herded together and were instead potentially managed in larger, more specialised flocks dedicated to specific environmental conditions.

Cattle isotopic values overlap with those of both sheep and goats, suggesting their subsistence on  $\text{C}_3$  plants from similar environments. However, the absence of the lowest  $\delta^{15}\text{N}$  values (below 5‰) observed in sheep and goats among the cattle data may indicate that cattle were more consistently managed in areas close to human settlements or were regularly fed manured agricultural crops. Cattle in proximity to settlements would also have had additional involvement in agriculture, for example, as draught animals, which could lead to them more frequently grazing manured crop stubble. The single cow exhibiting a  $\text{C}_4$  diet is discussed in a separate section on  $\text{C}_4$  resources below.

### Other species

The  $\delta^{15}\text{N}$  values represented by chickens, geese, pigs and one dog indicate a range of animal protein consumption among these omnivores. While acknowledging that herbivores also exhibited equivalent values for  $\delta^{15}\text{N}$  due to management practices discussed above, omnivores with high  $\delta^{15}\text{N}$  values instead are more likely to have incorporated animal protein into their diets (e.g. dairy, meat), which will increase their  $\delta^{15}\text{N}$  values. Chickens in particular reflected heavy anthropogenic influence on diet at all sites, which indicates they were closely managed, and potentially provisioned with manured fodder or human food scraps, or both, potentially at the household level. Both chickens and geese at the Alcázar Real de Guadalajara tended towards the highest  $\delta^{15}\text{N}$  values, which may attest to the importance of intensively reared poultry with higher proportions of such foods in their diet supplied to the elite Castilian castle. This patterning of high  $\delta^{15}\text{N}$  values for domestic geese, equivalent to (and even beyond) that of chickens, has been observed in isotopic data for geese elsewhere in the historic periods (Ehrlich *et al.* 2022).

Pigs are highly adaptable from a dietary and management perspective, and their wide range in isotopic values reflects the diverse range of husbandry and foddering regimes in which pigs were consistently kept in the medieval period, from the dominance of free-range herbivorous pannage to intensive, possibly backyard rearing at household level (Hammond and O'Connor 2013; Halley and Rosvold 2014). The presence of hunted wild boar at the royal palace Alcázar Real de Guadalajara is a possibility, especially given the remains of other wild species like partridge and pigeon at the site. These wild boar might have had a more herbivorous,

free-range diet, though it is important to note that wild boar are opportunistic omnivores with highly variable diets (Vedel *et al.* 2022). Size data for pigs to confirm the presence of wild boar was not possible to glean from the assemblage due to the low number of suitable pig elements present (Chapter 7).

The single dog specimen from Alcázar Real de Guadalajara possessed relatively high  $\delta^{13}\text{C}$  (-18.1‰) and  $\delta^{15}\text{N}$  (9‰) values indicative of a diet incorporating animal protein. The dog plots similarly to chickens at the same site (Fig. 8.1) and among the lowest  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values for humans across all sites (Fig. 8.4), which is consistent with the observation that dogs often possess isotopic values that overlap with or are slightly lower than associated human populations (Guiry 2013). Altogether, the isotopic data are in keeping with a commensal animal provisioned by humans.

Hake procured by the Alcázar Real de Guadalajara exhibited higher carbon and nitrogen isotope values in comparison to other fish species at the site, congruent with an origin from the Atlantic Ocean rather than the Mediterranean Sea (Llorente-Rodríguez *et al.* 2022). It is likely, however, that some of the other fish species with lower  $\delta^{15}\text{N}$  values, such as shad or meagre, may have been caught in the Mediterranean (García-Guixé *et al.* 2010). Historical records attest to the trade of fish for popular consumption far inland in Spain during the late medieval period (Navarrete 2009).

### $\text{C}_4$ crops in animal diets in Guadalajara

$\text{C}_4$  crops such as millets and sorghum were considered secondary crops in most regions of the Iberian Peninsula during the medieval period, used for both fodder and human consumption (Adamson 2004).  $\text{C}_4$  consumption among animals in Guadalajara is limited to a single chicken from the Alcázar Real de Guadalajara and a cattle specimen from the castle of Zorita de los Canes. Archaeobotanical evidence of proso millet (*Panicum miliaceum*) was recorded at Atienza (see Chapter 6), but it is not featured in the animal diets represented from the Jewish quarter. Notably, recent ethnographic research from the north-west Iberian Peninsula indicated the use of millets specifically for chicken feed and cattle fodder (Teira-Brión 2022), and  $\text{C}_4$  crops were mentioned among those grains used to fatten cattle and chickens in a 12th-century Andalusí agronomic text (*Kitāb al-filāḥa*, Ibn al-ʿAwwām 1802). A  $\text{C}_4$  contribution to the diets of domestic animals has been reported for other medieval sites from Iberia and commonly appears in the regions of Valencia and Asturias, most frequently for chickens and cattle, followed by sheep/goat (Alexander *et al.* 2015, 2019; López-Costas and Müldner 2019; MacKinnon *et al.* 2019). Altogether, the data indicate that consistent foddering with  $\text{C}_4$  plants was not common practice in the region of Guadalajara during the periods represented here. As the chicken and cattle specimens derive from broadly contemporaneous elite sites with extended supply catchments, these animals may

have derived from regions elsewhere where  $C_4$  crops were more consistently used for animal fodder or  $C_4$  provisioning could conceivably have been carried out locally at a small, potentially household scale given the potential input of  $C_4$  into the diets of some humans.

### Human diet

Isotopic data for human populations indicate an overwhelming reliance on  $C_3$  plants with a variable contribution of  $C_3$ -fed animal protein. During this period,  $C_3$  crops such as wheat and barley were the most desirable crops for human consumption, and these are the plants recorded most commonly in the archaeobotanical data (Chapter 6). Carbon isotope values for humans indicate that similarly to animals,  $C_4$  crops were not a regular staple in human diet in the Guadalajara region, but they were occasionally available and consumed, as evidenced by the noticeable  $C_4$  contribution to the diet of a few individuals (CS10F, CS07M, CG04) whose  $\delta^{13}C$  values hover around -18‰ and above, twinned with relatively low  $\delta^{15}N$  values between 9‰ to 10‰ (Ganzarolli *et al.* 2018) that would be difficult to attribute to marine input into the diet, even considering the marine fish with the lowest  $\delta^{15}N$  values from Alcázar Real de Guadalajara, around 10‰ (Fig. 8.3). The castle of Zorita de los Canes, however, stands apart for humans possessing  $\delta^{13}C$  values well beyond -18‰ and a range of  $\delta^{15}N$  values between 10.7‰ to 13.2‰. This could suggest a variety of consumption patterns ranging from marine fish (Pérez-Ramallo *et al.* 2024), particularly for those with the highest  $\delta^{15}N$ , or  $C_4$  plants either directly or indirectly through  $C_4$ -fed animal protein (chicken/eggs, cattle/dairy). Given the presence of Christian knights of lower nobility from the military Order of Calatrava among the burial population represented at the site (Pérez-Ramallo *et al.* 2024), diets rich in high trophic level animal protein and marine foods (the latter particularly associated with religious fasting in this period, Tomás 2009) are plausible. Equifinality in bulk  $\delta^{13}C$  and  $\delta^{15}N$  values for marine and  $C_4$ -fed animal protein means identifying  $C_4$  vs. marine in human diets, however, is challenging (Alexander *et al.* 2015; López-Costas and Müldner 2019). The diets of these humans are still open to question and could be resolved through the use of compound-specific isotopic approaches (Corr *et al.* 2005).

When comparing urban populations from Guadalajara, the  $\delta^{15}N$  values of the Campus de las Cristinas consistently showed higher values and only just overlapped with those from the Cemetery of Guadalajara. This observed difference was statistically significant. Interpreting this pattern based on chronology or religious affiliation is challenging. This is because the small sample from the Cemetery of Guadalajara ( $n = 9$ ), which comprises both seven 10th- to 11th-century Islamic individuals and two 15th- to 16th-century Christian individuals, displays similar isotopic values despite these

internal chronological and religious differences. Although evidence for status cannot be gleaned from the burial evidence, potential differences in social status and related access to higher trophic level foods among those at Campus de las Cristinas may be a factor. Nevertheless, limited sample sizes preclude a definitive interpretation.

The outlying individual from Zorita de los Canes with notably low  $\delta^{13}C$  and  $\delta^{15}N$  values (ZC\_T03) has  $\delta^{15}N$  values in keeping with potentially poor burials hypothesised to have consumed little animal protein at a hospital at San Vicente in Valencia (Alexander *et al.* 2019). ZC\_T03's low  $\delta^{13}C$  value, however, may reveal them as non-local from an area with a colder climate or differing isotopic baseline when compared to the vast majority of the animals in the local dataset. This population is likely to have seen high mobility due to the connection with the military order, and non-locals might be expected among those buried here (Pérez-Ramallo *et al.* 2024). Further research incorporating oxygen and strontium isotopes would aid in the identification of non-locals at this site, which could also be driving the diversity in carbon and nitrogen isotope values.

Plate 8.6 compares later medieval sites in Guadalajara (10th–16th century, urban and military) to published isotopic data for earlier medieval (5th–8th c, rural) populations located in the central Meseta region with the same climate: Cubillejo de la Sierra (Guadalajara, Peralta *et al.* 2022), Gózquez (Madrid, García-Collado 2016) and Boadilla (Toledo, García-Collado *et al.* 2019). The early medieval sites possess distributions in isotopic values similar to those seen in the Cemetery of Guadalajara and those with lower  $\delta^{15}N$  values from the Cathedral of Sigüenza, although Campus de la Cristinas and Zorita de los Canes tend towards higher  $\delta^{15}N$  values. Statistical comparison via a Kruskal-Wallis test indicates these differences in  $\delta^{15}N$  are statistically significant ( $\chi^2(6) = 37.72$ ,  $p < 0.001$ ) and *post hoc* comparisons (Dunn's test with Bonferroni adjustment) point at significant differences in  $\delta^{15}N$  between Gózquez and both Campus de la Cristinas ( $p = 0.016$ ) and Zorita de los Canes ( $p < 0.001$ ), and Boadilla and Zorita de los Canes ( $p = 0.010$ ). The distribution of  $\delta^{13}C$  values is broadly similar between periods but once again Zorita de los Canes stands apart again for possessing higher  $\delta^{13}C$  values. This is statistically borne out with a Kruskal-Wallis test, indicating a statistically significant difference in  $\delta^{13}C$  between the populations ( $\chi^2(6) = 17.88$ ,  $p = 0.010$ ), and *post hoc* comparisons (Dunn's test with Bonferroni adjustment) reveals this is driven by significant differences between Gózquez and Zorita de los Canes ( $p = 0.003$ ). Altogether, this could indicate diet of the general population in this central region of Iberia, whether urban or rural, did not experience large shifts between periods of differing socio-political and religious control, but social status played a role in accessing higher trophic level resources and potentially fish. Incidentally, Christian Visigothic individuals from Boadilla demonstrated

a limited but variable input of  $C_4$  resources into their diet (García-Collado *et al.* 2019) which, together with the data from Christians from the later period demonstrated here, further underlines that faith identity is not a major factor in reliance on  $C_4$  crops in this region and is more likely to be the result of, e.g., local growing conditions and/or potentially reliance in times of  $C_3$  grain shortage.

Compared to broadly contemporaneous populations from later medieval Spain located in a similar climate, the populations from Guadalajara have  $\delta^{13}C$  values indicating a lesser reliance on  $C_4$  resources than rural and some urban Islamic populations from the area of Valencia (Salazar-García *et al.* 2014; Alexander *et al.* 2015; 2019) and Andalucía (Inskip *et al.* 2019; Jiménez-Brobeil *et al.* 2021). Instead, those from the Cemetery of Guadalajara and Cathedral of Sigüenza with  $\delta^{15}N$  values around 10‰ to 11‰ and lower are similar to urban populations subsisting mainly on  $C_3$  resources and a variable intake of animal protein, such as Muslims at Écija, Seville (Inskip *et al.* 2019), Christians from Valencia city (Alexander *et al.* 2019) and Portales 67 (Pérez-Ramallo *et al.* 2022), as well as the rural Christian site of San Baudelio de Berlanga in northern Castile (Jiménez-Brobeil *et al.* 2020). Interestingly, those with slightly higher  $\delta^{15}N$  values over 11‰ from the castle of Zorita de los Canes have carbon and nitrogen isotopic values within the range exhibited by Muslims from the coastal suburban site of Tossal de les Basses, Alicante, interpreted as consuming marine foods (Salazar-García *et al.* 2016). As noted in the previous isotopic study examining the castle of Zorita de los Canes population (Pérez-Ramallo *et al.* 2024), those with the highest  $\delta^{15}N$  values are similar to individuals from the Order of Calatrava buried in Évora (MacRoberts *et al.* 2020) and the Aragonese social elite represented at San Pedro el Viejo (Martínez-Jarreta *et al.* 2017; Pérez-Ramallo *et al.* 2022), reflecting their elevated status and access to high trophic level protein.

## Conclusion

The wide-ranging isotopic data presented here provide valuable insights into animal management and human diet in the Guadalajara frontier during a period of significant cultural transition. Despite a primary reliance on  $C_3$  resources, the considerable variability in domestic animal diets highlights the diverse environmental conditions and animal management strategies in the region. This suggests that multiple ecological zones were exploited for animal grazing and fodder, demonstrating the adaptive nature of subsistence practices in the region. The isotopic values of sheep in Guadalajara, for instance, hint at potential shifts in livestock provisioning strategies between periods of Islamic and Christian rule. These changes are likely linked to status differences and the more extensive and specialised provisioning networks that supplied the elite at the Alcázar Real de Guadalajara royal

palace. Beyond terrestrial resources, the presence of marine fish, sourced from both the Atlantic and Mediterranean for the table of the social elite, further underscores the draw on long-range resources extending beyond the immediate frontier. Furthermore, the distinct isotopic patterning exhibited by sheep and goats throughout the dataset is intriguing, potentially indicating differing management for caprines in this region. This highlights the power of combining ZooMS and isotopic data for these species (Vaiglova *et al.* 2014). However, further data from additional sites is needed to confirm whether this is an emerging trend or a phenomenon specific to these sites in Guadalajara.

Notably, with singular exceptions, neither animals nor humans consistently relied on a significant input of  $C_4$  plants such as millets, a finding which aligns with their low representation in the region's archaeobotanical data (Chapter 6). While human diets generally appear fairly similar across the different urban sites investigated, a detailed exploration of the influence of ethno-religious affiliation and chronology on diet proves challenging. This is largely due to the chronologically and religiously heterogeneous nature of certain sampled populations (even within the Cemetery of Guadalajara site itself) and overall limited sample sizes. Despite these interpretive challenges, the distinctly broad profile carbon and nitrogen isotope values represented within the population affiliated with the military order at the castle of Zorita de los Canes provide insights into diet within a specific socio-cultural setting that likely harboured a highly mobile population, including high-status members of the low nobility.

Ongoing and future research will significantly enhance our interpretive toolkit for animal management and human diet in Guadalajara. This will involve incorporating additional stable isotopes, such as sulphur, strontium and oxygen, which will facilitate a more comprehensive exploration of animal mobility (and potential transhumance) and broader dietary patterns within the Guadalajara frontier region. Future investigations will also include additional sites from the eastern part of the region, detailed elsewhere in this volume, for example, the the castle of Molina and Prao de los Judíos. Furthermore, the systematic integration of these new isotopic datasets with growing zooarchaeological and archaeobotanical datasets promises to provide an even more nuanced and holistic understanding of subsistence strategies and human-animal interactions on this dynamic medieval frontier.

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# Metal production after the Christian conquests in Iberia (12th–15th centuries): The Lordship of Molina de Aragón (Guadalajara, Spain)

*Yaiza Hernández-Casas, Mercedes Murillo-Barroso, Jesús Alberto Arenas  
Esteban and Guillermo García-Contreras*

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## Introduction

The location of settlement in relation to natural resources and how the latter are exploited are two crucial factors for the study and characterisation of social formations. The exploitation, use and distribution of resources reflect both technological knowledge and economic organisation. This chapter examines metal production in Iberian feudal societies through the analysis of this activity in Molina de Aragón and its associated historical territory, one of the key case studies in the Landscapes of (Re)Conquest project.

Here, Molina de Aragón is presented as a paradigmatic example of mining and metal production, and their relationship with medieval seigniorial structures. The first section characterises the mining-metallurgical landscape of the Lordship of Molina, identifying the main areas exploited and their metal resources. The second section examines the written and archaeological sources from the town, where metal was worked and sold. In particular, the chapter will focus on the settlement of Castil de los Judíos, where the Jewish community dwelled and where a craft area dedicated to metalwork was identified.

The following section presents the results of the preliminary archaeometallurgical analysis of some metal production remains (ores, slags and other forms of waste) excavated in the Jewish quarter. It focuses on the mineralogical and isotopic characterisation of copper ores – in relation to local geology – and the compositional and microstructural analysis of slag samples. This has revealed aspects pertaining to the raw materials, the technology used and the *chaîne opératoire* followed by craftspeople at the site. Finally, the archaeometric results are incorporated into a brief historical discussion about the role played by metal production and its specialised craftspeople (and their identity) in medieval Iberia's feudal economy.

## Geological context of the Lordship of Molina de Aragón. A rural mining and metallurgical landscape?

The territory of the medieval Lordship of Molina de Aragón is situated in the north-east of the modern province of Guadalajara (Castilla-La Mancha, Spain) (Plate 9.1). It is part of the western, Castilian sector of the Sistema Ibérico. To the north, it borders with Sierra de Pardos, and farther north-east with Sierra de Aragoncillo, which separate the basins of the Ebro and Tajo rivers. To the south, it borders with the confluence of the Cabrillas and Tajo rivers. To the west, it borders with the Cretaceous knolls that outline the shores of the Tajo, and to the east with Sierra Menera and the modern province of Teruel (González Amuchastegui 1997, 403). The water courses used to select and wash the ores and in the operation of the water-driven furnaces, and the accessibility of mountain areas – alongside abundant resources of highly calorific firewood – have facilitated the exploitation of mining resources in the region since protohistory (Rovira *et al.* 2002).

Three areas are particularly outstanding in terms of mineral resources. The eastern sector of Sierra Menera, the hills to the south, and Sierra de Pardos, to the north-east (Plate 9.2). Sierra Menera is particularly rich in iron, and the medieval exploitation of this resource has been examined archaeologically in the past (Rico *et al.* 2005; Ortega 2008; Fabre *et al.* 2012). To the south, Sierra del Tremedal, La Serrezuela and Sierra Beteta are especially rich in mineral resources (Benedicto Gimeno and Mateos Royo 2013). Finally, Sierra de Pardos, as well as iron, yields copper and silver, for instance in Mina La Estrella (Vilaltella Farràs *et al.* 2019). Many of these mining areas





Fig. 9.1. Current overview of the Setiles iron mines in Sierra Menera (Guadalajara)

are visually connected with the castle of Molina, where the feudal authority sat (Adamuz Osuna 2022).

### **Sierra Menera and iron ore mining**

Sierra Menera is situated in the border of the modern provinces of Teruel and Guadalajara. It must have been included in the ‘*amal*’ of the Middle March of al-Andalus, under the Banū Razīn during the caliphate and a *taifa* from 1013 (Ortega 2008, 98). Important iron deposits, mostly limonite and goethite, are found between the limestones and Ordovician dolomites, in the central area (Ortega 2008, 100–101; Fabre *et al.* 2012, 46) (Fig. 9.1). Other two Tertiary minerals may have also been exploited. First, a siderolithic mineral that results from the deposit of iron oxides in karstic cavities, perhaps in the Andalusi mine of Las Covachuelas (Setiles); second, a mineral that results from the alteration of ferric conglomerates on the northern sector of the hill range. In addition, the archaeometric analysis of slags from the old metallurgical settlement of Saletas revealed high concentrations of CaO, as a result of the use of a lime-rich mineral also attested in the stratigraphy (Fabre *et al.* 2012, 48–51).

Sierra Menera was intensively exploited during the Early Modern and Modern ages, which obscures earlier settlements and slag heaps. The earliest mentions of mining activity during the pre-Roman, Roman and medieval periods were published by mining engineers in the 19th and early 20th centuries (e.g. Kindelán 1918). More recent studies identified a total of 92 slag heaps dated from the 2nd century BC to the 16th century, as well as forge lenses (Rico *et al.* 2005; Fabre *et al.* 2012). This indicates the presence

of workshops, generally in flat or gently sloping areas, near extraction points and water courses (Rico *et al.* 2005, 347; Fabre *et al.* 2012, 48–49). Other works that focus on the medieval period have pointed their research to the role played by mineral resources in the social organisation of Andalusi groups (Ortega 2008 and 2021). Over 30 enclaves related to iron metallurgy dated, based on the pottery record, to the second half of the 11th century have been identified; these have many parallels in the area around Calatayud and especially around Molina (Ortega 2008, 98).

Everything suggests that, during the Andalusi period, mining operations were undertaken in an eminently peasant context, formed by small communities that combined agricultural activity with different degrees of involvement in metal reduction and working (Ortega 2021, 133). This is indicated by the settlement pattern, which comprises *hūsūn*, villages and towers, as well as mining settlements, which have been largely obliterated by later mining activity (Ortega 2008, 103–114; García-Contreras Ruiz 2018, 52). Some documented examples include Mina de la Virgen Vieja (Almohaja, Teruel), where the mine was adjacent to a settlement, remains of metallurgical workshops, furnaces, slag heaps and a dump site for building debris (Ortega 2008, 104). The abandoned medieval site of Mierla, in Ojos Negros – occupied both in the Andalusi period and after the Christian conquest – can help us to understand the relationship between water availability, irrigation and metal production, strongly suggesting that, for these communities, agriculture and mining were closely related (Ortega 2008, 117–118). At any rate, the evolution of settlement patterns over time

reflects continuity in metallurgical activity between the Andalusi and Christian periods (Plate 9.4).

### ***The metallurgical exploitation in the southern mountains: The late medieval hydraulic forges***

The mining sites in the hill ranges to the south of Molina were also part of the mining concessions in the area from the Late Middle Ages, although the slag heaps suggest that some may have been exploited since antiquity (Kindelán 1918, 100; Benedicto and Mateos 2013, 52).

Several late medieval water-powered iron mills have been attested in the area, especially in the banks of the Cabrillas and, especially, Hozseca rivers (Cortés Ruiz 1995; Benedicto 2016). While the archaeological record indicates that during the Andalusi period most metallurgical activity took place near the main settlements in Sierra Menera, in the late medieval period these works shifted to the riverbanks in the southern sector (Cortés 1995, 476–477; Lázaro Molinero 1995, 94–95). This may be explained by the social and economic changes brought about by the imposition of a feudal system, as well as by technological factors, such as the development of water-powered mills, which used water to regulate air intake and temperature and drive bellows and hammers (Cortés 1995, 750).

Based on a document in Archivo General de Simancas M<sup>a</sup> Elena Cortés Ruiz (1995) argued for the existence of at least seven iron mills in the banks of the Hozseca: the *nueva* and *vieja* iron mills in Checa, one in Hozseca, one in Peralejos, one in Chequilla, and the *nueva* and *vieja* iron mills in Megina (Cortés 1995, 478–479; Benedicto 2016, 92–95). She also documented the arrival of Basque ironworkers, generically known as *vizcaínos*, to Molina (Cortés 2000, 525), which strongly suggests that these iron mills were recruiting specialists from one of Iberia's main ironworking regions (e.g. Franco *et al.* 2015). These took the mills – generally the property of Molina's wealthiest families – on lease, and created settlements in the hills, perhaps after the installation of water-powered mills and the relocation of the main iron-transforming facilities to the southern riverbanks (Cortés 2000, 644–645 and 751).

This does not mean that ironworking was new to the area. For instance, the will of Blanca Alfonso, dated to 1293, bequeaths all mills in Molina to Fernán Sánchez (Barrios Martínez 2017, 354): 'Mando a Fernan Sanches Setiles, El Povo e todas las ferrerías de Molina' (Perruca Díaz 2012, 63–66). This suggests that, during the 12th and 13th centuries, the exploitation of mines in the manor was in seigniorial hands (Cortés 2000, 930), as in the rest of western and Iberian feudal regions (e.g. Sánchez Gómez 1989; Nogales Rincón 2021).

### ***Sierra de Pardos and La Estrella, a copper and silver mine***

Important iron deposits, especially oxides and carbonates, can be found in Sierra de Pardos, in relation to carbonated

Ordovician levels, for instance in the mines of Las Majadillas, the range's most important iron extraction point (Vilaltella *et al.* 2019, 629). Despite its purity, iron was only extracted in Pardos only for a brief period, as it could not compete with the abundant yields from Sierra Menera (Benedicto and Mateos 2013, 50).

However, Sierra de Pardos yields other metals apart from iron, such as copper and silver, especially in Mina La Estrella, which has been exploited until recently, as attested by extant buildings, wells and galleries (Fig. 9.2a–c). The copper exploited seems to have been primary ores, although over 30 different minerals have been identified in the mine. Primary copper minerals found include bornite, chalcopryrite, cubanite and tetrahedrite – a silver-rich antimony sulphide, one of the so-called grey copper or fahl-ore – secondary ores such as azurite, malachite, antlerite, brochantite, chalcantite and chrysocolla are frequent. The primary silver mineral exploited was argentite, although native silver, stephanite, pyargyrite, polybasite, proustite and tetrahedrite, as well as goethite – always in the form of limonite – hematite, pyrolusite, calcite and quartz are also present (Vilaltella *et al.* 2019, 627).

X-Ray Diffraction (XRD) analysis of a selection of six samples collected with the help of Geoparque Molina-Alto Tajo has led to the mineralogical characterisation of the minerals in La Estrella (Fig. 9.2d). Major minerals include azurite ( $\text{Cu}_3+2(\text{CO}_3)_2(\text{OH})_2$ ) and malachite ( $\text{Cu}_2+2(\text{CO}_3)(\text{OH})_2$ ), related, respectively, with blue and green deposits; quartz ( $\text{SiO}_2$ ), which explains the brown colour of the mineral's surface; and tetrahedrite ( $\text{Cu}_{12}\text{Sb}_4\text{S}_{13}$ ). The latter is the most abundant mineral in MMM\_4. Minor minerals include mimetite ( $\text{Pb}_5(\text{AsO}_4)_3$ ), segnitite ( $\text{Pb-Fe}_3(\text{AsO}_4)_2(\text{OH})_5(\text{H}_2\text{O})$ ), bindheimite ( $\text{Pb}_2\text{Sb}_2\text{O}_7$ ), and also azurite ( $\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$ ) and mica phyllosilicates (Plate 9.3). These results are in line with semiquantitative portable X-Ray Fluorescence (pXRF) analysis, which yields values for Cu (8.53–34.98%), significant Fe (0.10–15.44%), Pb (0.09–28.42%), As (0.03–4.43%) and Sb (0.08–31.84%), and traces of Ag (0.12–0.60%) (Table 9.1).

## **The town of Molina, centre for metal production and trade**

### ***Written sources***

In the 11th century, as the caliphate collapsed and the *taifa* kingdoms formed, the territory of Molina was initially under the authority of Toledo and later of the Almoravids (Barrios 2017, 15; García-Contreras Ruiz *et al.* 2023a, 66). The earliest written and archaeological evidence of settlement is dated to this period, and it has been suggested that Molina was the capital of a *taifa* (Pérez Fuertes 1990). This must have been the period of the *qā'id* Ibn Galbon mentioned in the sources, the best known of which (a literary, rather than historical source) is *Cantar de Mio Cid* (Arenas and Martínez 2004, 439; Barrios 2017, 15). This poem mentions Ibn



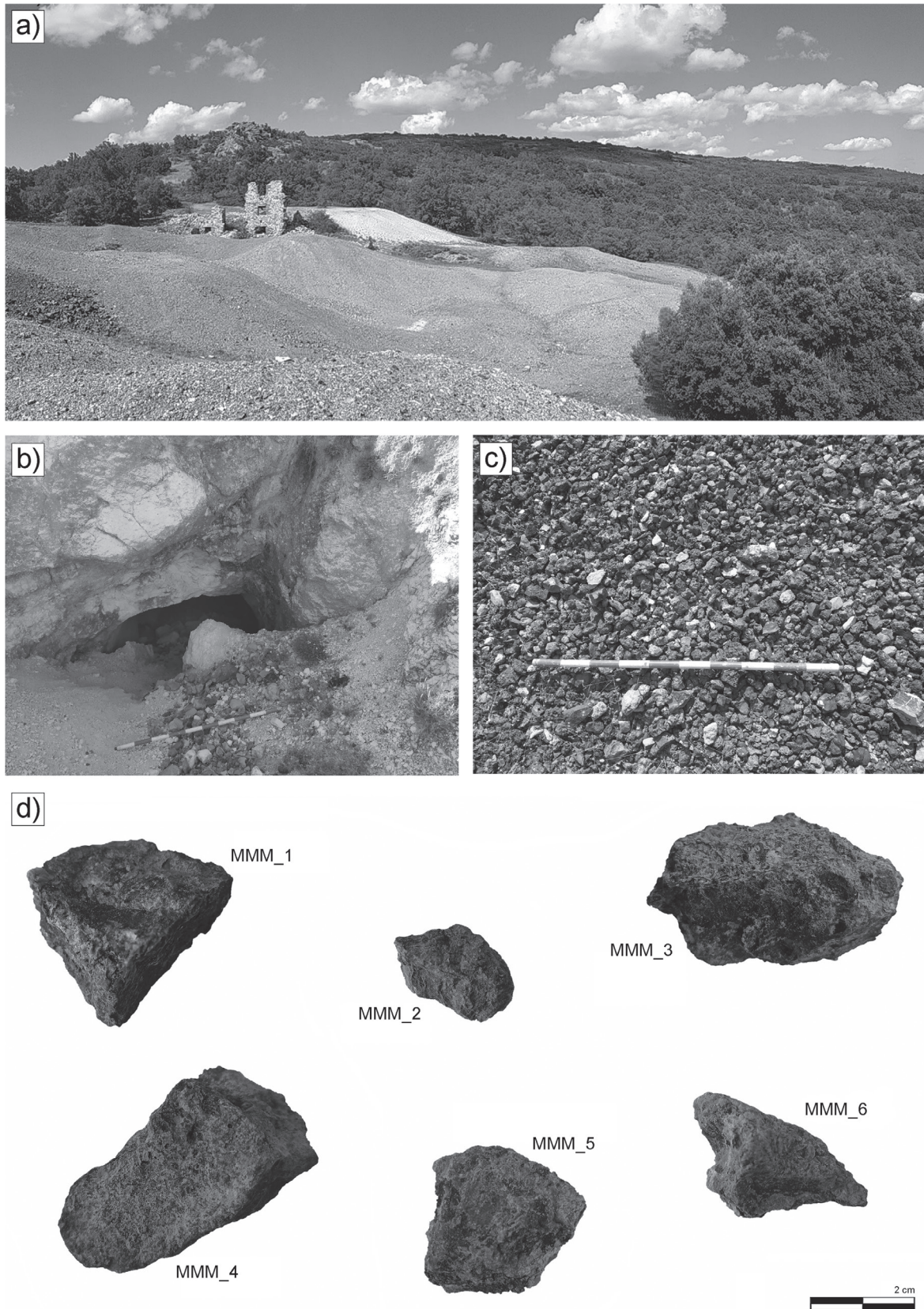


Fig. 9.2. a) Panoramic view of Mina La Estrella (Pardos, Guadalajara); b) Access to one of the galleries; c) Ore heap, from which the geological minerals were sampled; d) Selected copper ores (MMM\_1–MMM\_6)



Table 9.1. *p*XRF results of copper ore samples from Mina La Estrella (Pardos) and Castil de los Judíos (Molina de Aragón). Values normalised to 100%, expressed in wt%. Analysis carried out with an INNOV-X spectrometer belonging to the National Archaeological Museum (Madrid). Technical description in Rovira Llorens and Montero Ruiz (2018)

| Num. analysis (PA)          | Sample    | Area of analysis | Ti   | Fe    | Ni   | Cu    | Zn   | As   | Ag   | Sb    | Pb    | Bi   | Others |
|-----------------------------|-----------|------------------|------|-------|------|-------|------|------|------|-------|-------|------|--------|
| <b>La Estrella Mine</b>     |           |                  |      |       |      |       |      |      |      |       |       |      |        |
| PA29128A                    | MMM_1     | Multicolour      | nd   | 1.29  | nd   | 18.58 | 0.07 | 0.31 | nd   | 0.35  | 0.33  | 0.10 | 78.89  |
| PA29128B                    |           | Blue             | nd   | 0.68  | nd   | 14.32 | 0.04 | 0.20 | nd   | 0.21  | 0.32  | 0.05 | 84.18  |
| PA29128C                    |           | Green            | nd   | 2.81  | nd   | 34.98 | 0.20 | 1.37 | 0.24 | 0.97  | 1.59  | 0.55 | 57.28  |
| PA29129A                    | MMM_2     | Blue and green   | nd   | 0.10  | nd   | 8.53  | nd   | 0.04 | nd   | nd    | 0.12  | nd   | 91.21  |
| PA29129B                    |           | Green crust      | nd   | 10.32 | nd   | 22.65 | 0.16 | 4.43 | 0.60 | 31.84 | 28.42 | 1.57 | nd     |
| PA29130A                    | MMM_3     | Dark green       | nd   | 15.44 | 0.03 | 9.54  | 0.38 | 1.94 | 0.12 | 3.97  | 2.45  | 0.09 | 66.04  |
| PA29130B                    |           | Grey             | nd   | 4.89  | nd   | 16.14 | 0.67 | 2.25 | 0.32 | 6.83  | 2.63  | 0.28 | 65.99  |
| PA29131A                    | MMM_4     | Green            | nd   | 0.70  | 0.02 | 20.76 | 0.06 | nd   | nd   | nd    | 1.04  | nd   | 77.43  |
| PA29131B                    |           | Green fracture   | nd   | 1.70  | nd   | 17.51 | 0.07 | nd   | nd   | nd    | 0.45  | nd   | 80.27  |
| PA29131C                    |           | Blue and green   | nd   | 1.09  | nd   | 23.74 | 0.06 | nd   | nd   | 0.08  | 0.38  | nd   | 74.65  |
| PA29132A                    | MMM_5     | Blue             | nd   | 0.43  | nd   | 7.86  | nd   | 0.06 | nd   | nd    | 0.09  | nd   | 91.56  |
| PA29132B                    |           | Blue and brown   | 0.22 | 0.52  | nd   | 6.38  | nd   | 0.13 | nd   | nd    | 0.17  | nd   | 92.57  |
| PA29133A                    | MMM_6     | Blue and white   | nd   | 0.26  | nd   | 16.31 | nd   | 0.04 | nd   | 0.08  | 0.33  | nd   | 82.97  |
| PA29133B                    |           | White            | nd   | 0.28  | nd   | 13.93 | nd   | 0.03 | nd   | 0.13  | 0.47  | nd   | 85.17  |
| PA29133C                    |           | Dark blue        | nd   | 0.32  | nd   | 22.76 | nd   | 0.05 | nd   | 0.24  | 0.81  | nd   | 75.82  |
|                             | $\bar{X}$ |                  | 0.01 | 2.72  | 0.00 | 16.93 | 0.11 | 0.72 | 0.09 | 2.98  | 2.64  | 0.18 | 73.60  |
|                             | Std. Dev  |                  | 0.06 | 4.42  | 0.01 | 7.52  | 0.19 | 1.27 | 0.17 | 8.21  | 7.18  | 0.41 | 22.71  |
| <b>Castil de los Judíos</b> |           |                  |      |       |      |       |      |      |      |       |       |      |        |
| PA29134                     | MMM_7     | Blue             | nd   | 3.41  | nd   | 25.60 | nd   | 1.05 | nd   | 5.41  | 2.52  | 0.17 | 61.84  |
| PA29134B                    |           | Green            | nd   | 5.87  | nd   | 9.74  | 0.08 | 1.06 | 0.10 | 6.92  | 4.24  | 0.39 | 71.60  |
| PA29135A                    | MMM_8     | Dark blue        | nd   | 0.10  | nd   | 24.43 | nd   | 0.04 | nd   | nd    | 0.16  | nd   | 75.27  |
| PA29136                     | MMM_9     | Light green      | nd   | 0.14  | nd   | 96.20 | nd   | 0.41 | nd   | 1.49  | 1.76  | nd   | nd     |
|                             |           | $\bar{X}$        | -    | 2.38  | -    | 38.99 | 0.02 | 0.64 | 0.03 | 3.46  | 2.17  | 0.14 | 52.18  |
|                             |           | Std. Dev         | -    | 2.80  | -    | 38.82 | 0.04 | 0.50 | 0.05 | 3.25  | 1.69  | 0.18 | 35.24  |

Galbon several times as leader of Molina. In the following passage, the Cid's troops, commanded by Alvar Fáñez de Minaya, rest in Molina on their way to Valencia:

Entrados son a Molina, qu' es muy buena e rica casa  
Allí el moro Avengalvón bien los servía sin falla,  
ca de cuanto que quisieron non ovieron nula falla;  
aun demás las herraduras él quitárgelas mandava,  
a Minaya e a las dueñas ¡Dios cómo bien las ondrava!

(*Mio Cid*, II, v. 1550–1554)

The interesting point about this fragment is that Ibn Galbon orders – and pays for – new horseshoes for Minaya's whole host, which included a large number of horses, suggesting

the presence of an ironsmith in Andalusí Molina in the 11th century. This should not be surprising, as the landscape is peppered with iron deposits and numerous 10th- and 11th-century settlements were related to metal extraction (Ortega 2008, 2021). In addition, there is evidence for a *Mudéjar* community in the town, which combined agriculture with ironworking (Cortés 2000, 943 and 1271). In the late 15th century, there was at least one forge in the town, worked by a Muslim ironsmith, Yoçé Pachel *the Elder*, in the Muslim quarter (Cortés 2000, 943). This strongly suggests that in the Castilian period specialised metalworkers were still active in Molina (Hernández-Casas 2024, 263).

After the region was conquered by Alfonso I of Aragón in 1128, Molina was annexed by the Crown of Castile, becoming a feudal manor owned by a branch of the Lara family (García-Contreras Ruiz *et al.* 2023b, 5). The territory or *alfoz* was ruled from the town – which as the administrative, economic and institutional centre – and included fortifications, castles, towers, hamlets, churches and monasteries. The new settlement pattern reflects the typically seigniorial social hierarchy (García-Contreras Ruiz 2018, 54–68). Another reflection of the seigniorial relations that organised society in these manors were their *fueros* (charters), which from the 12th century created different statuses based on residence, property, trade and religion. This is also the case with Molina de Aragón, whose *fuero* was issued by Manrique de Lara between 1152 and 1154, with a final amendment in 1283 (Barrios 2017, 215).

Although this *fuero* is less explicit than others – e.g. Cuenca or Teruel (Hernández-Casas 2024, 215–218) – in terms of mining and metal production, some of its clauses provide some evidence about metal production and consumption, especially iron. Some of these clauses regulate the work of a number of crafts – e.g. furriers, cobblers, weavers – to guarantee the quality of their production and control weights and measures, which suggests that the city council was in charge of supervising craftspeople and the market (Barrios 2017, 222–223). Two of the clauses are of particular interest for ironsmiths. One forbids the purchase and sale of iron to anyone who was not an ironsmith: ‘Whoever buys iron to sale it not being an ironsmith will pay 60 *sueldos*’ (*Fuero de Molina*, XXVI, VII). The second fines ironsmiths, among other craftspeople, for edging the horseshoes: ‘Whoever soles, shoes or horseshoes edges will pay five *sueldos*’ (*Fuero de Molina*, XXVI, XIII).

Other sources provide evidence for ironworking in Molina, for instance the earliest documents that mention Christian ironsmiths, especially Pedro Domingo, in 1226, and Julián Marx, in 1284, in addition to the above-noted 15th-century ironsmith (Salazar y Castro 1694, 29; Pérez 1992, 197; Cortés 2000, 944). Although there is no evidence of a guild for ironsmiths, it is likely that they grouped under a trade statute, like the weavers – a Calle Tejedores still survives in the modern street layout – and the cobblers (Cortés 2000, 944–945). The record attests that ironworkers included farriers, as mentioned in the *fuero*, cutlers and locksmiths. These were members of the Cabildo de Ballesteros de San Sebastián, founded by Blanca Alfonso in the late 13th century (Pérez 1992, 197; Cortés 2000, 944).

Concerning other metalwork, the earliest evidence is dated to the 14th century. Bellmakers and coppersmiths are mentioned in a document dated to 1376, in which Enrique II, from Seville, confirmed Molina’s *fueros* and privileges (Barrios 2017, doc. 31). There is also evidence for silver exploitation, especially in the above-mentioned mines of Pardos. This silver was used by silversmiths, whose goods

were on sale in Molina from at least 1484: ‘The *alcabalas* for gold and silver embroidery and other metal in the town of Molina was paid’ (A. G. S. Diversos de Castilla, leg. 5, n°2, *vid.* Cortés 2000, 946).

Metalwork in Molina not only involved the manufacturers of metal objects who generally resided in the town, but also the concessionaires of the mines in the surrounding territory and the owners and workers of the hydraulic forges in the south of the lordship, operated by the Basque forgers who arrived from the 15th century onwards. Therefore, the metal, including iron, extracted and transformed in the villages was taken to the town, where it was likely sold in the Thursday market, on which hamlet-dwellers and the inhabitants of other settlements in the region converged (Cortés 2000, 1000; Barrios 2017, 359). As early as the first quarter of the 14th century, the crown authorised Molina to hold an annual fair, as mentioned in a document pertaining to the Teruel-based cloth merchant Raimon Rovira, who came to this fair in 1332 (Diago Hernando 1997, 204; Barrios 2017, 359), and another one referring to the also cloth merchant Guillermo Arnald Brun, who went to Molina from Daroca in 1369 (Diago 1997, 189; Barrios 2017, 359).

If Molina’s fair was frequented by merchants from afar, the Molina-based merchants also visited other fairs and markets to bring other goods to the town. This included metal objects, for instance those brought by Faraix de Belvis, ‘a Moor from Molina’, from Zaragoza in 1386, comprising, among other items, 15 harnesses, 6 breastplates, 30 Genoese crossbows and 60 crossbow bolts (Sesma Muñoz 1997, 140; Barrios 2017, 361).

### ***The archaeological record: A metallurgical workshop in Molina’s Jewish quarter***

Therefore, the written record clearly attests to the activity of metalworkers in Molina. What does archaeology say from a material culture perspective? Several excavations were undertaken in Molina before 2016, when archaeological work in the castle resumed within the framework of the project that this volume summarises (García-Contreras *et al.* 2023b) (*vid.* Arenas Esteban 2008 for excavations carried out before 2005). Without a doubt, the most important of these excavations was the one undertaken at the site of Castil de los Judíos between 1998 and 2005 (e.g. Arenas and Martínez 2004; Arenas *et al.* 2007; Arenas 2008).

Castil de los Judíos is situated on a small knoll to the south-east of the castle, at the highest point of the modern town (Fig. 9.3a). It was a small urban quarter inside, and abutting, the southern and eastern sections of the wall that surrounded the medieval town, built between the mid-12th century and the third quarter of the 13th century (Arenas 2008, 438). It was arranged along an east–west axis, comprising a number of buildings and open spaces. The quarter’s heyday spans the 13th and 15th centuries. At its centre there is an exceptional synagogue with a number of auxiliary buildings (Arenas 2017) (Fig. 9.3d).



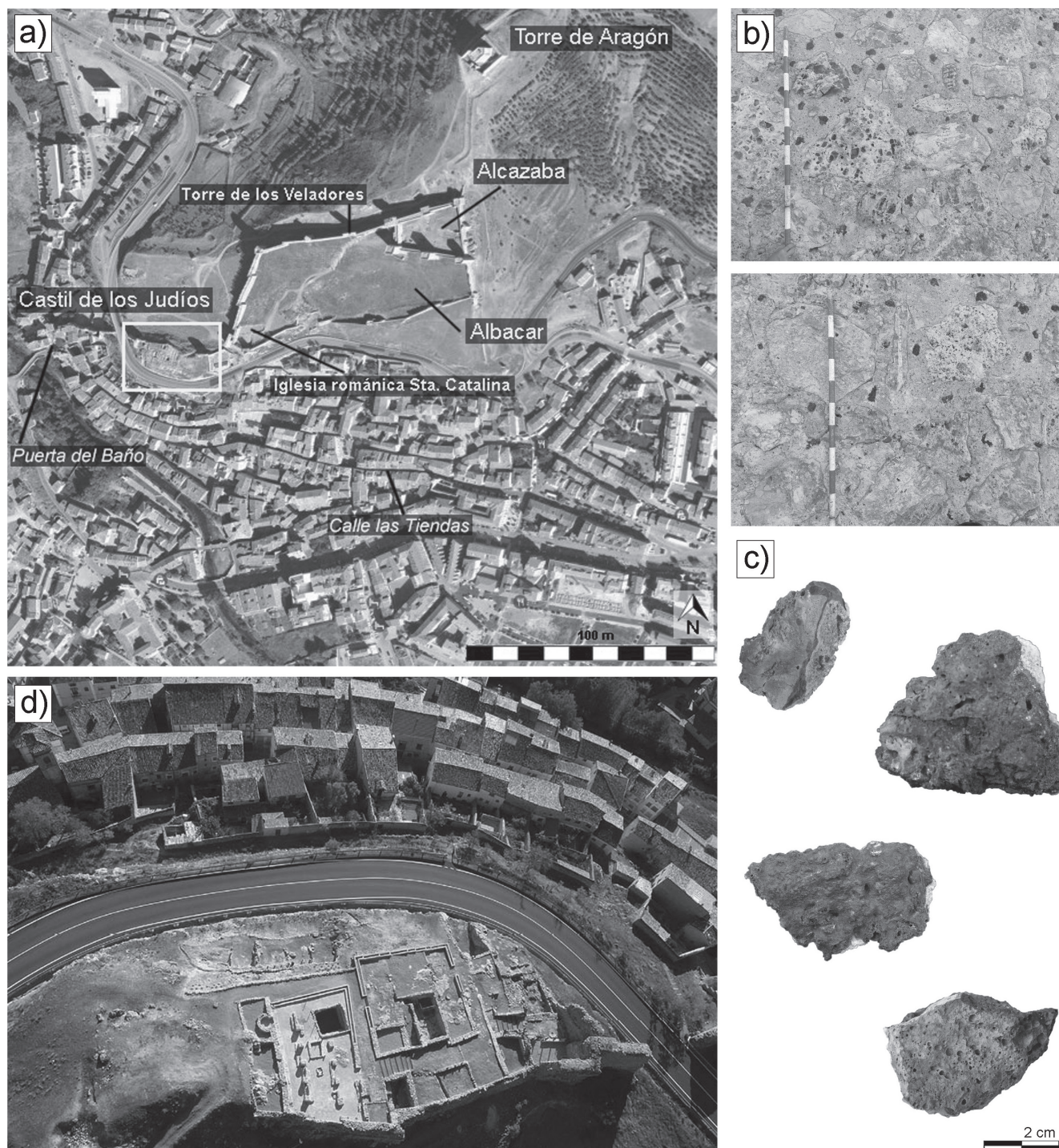


Fig. 9.3. a) Aerial view of the town of Molina de Aragón (Guadalajara), showing the different areas of the castle and the main archaeological remains; b and c) Iron slags in the masonry of the west wall of the castle, built in the 13th century; d) Castil de los Judíos at the end of the 2005 excavation. The Jewish quarter continues on the other side of the N-211 road (Source: Arenas 2017, 35)

In addition to the synagogue, two other sectors were documented. To the south-east of this urban quarter there was a residential area, comprising several two-storey houses. At the western end, below a rubbish dump dated to between the second third of the 14th century and the mid-15th century,

there were a number of light, semi-open features made of wood and plaster (Arenas 2003, 23–24; 2008, 37) (Fig. 9.4a). The excavation of the latter (Structures E, I-1, I-2 and J) yielded a large millstone carved in sandstone and a water trough near an underground channel (Fig. 9.5a–d), as well



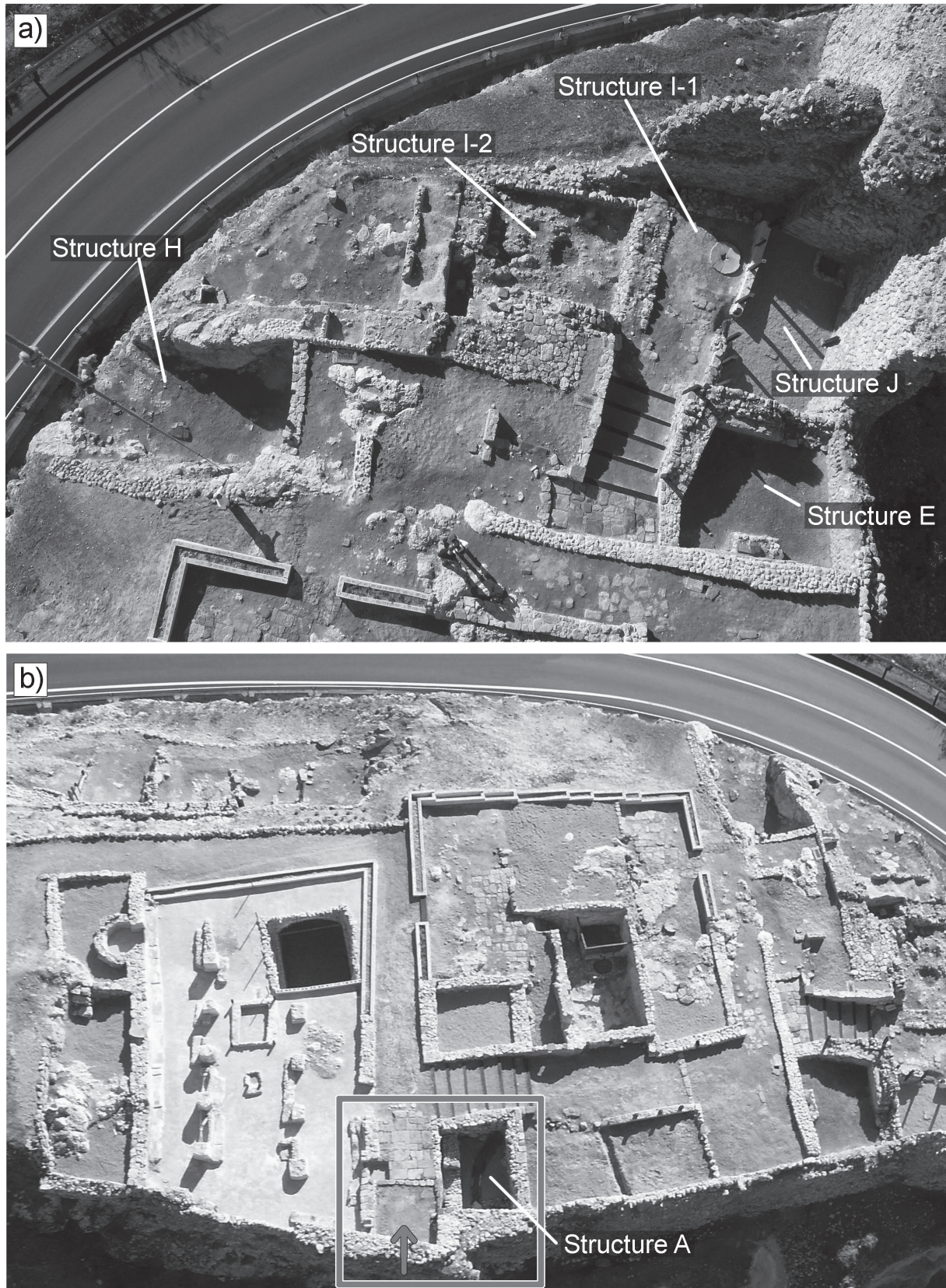


Fig. 9.4. Aerial view of Castil de los Judíos indicating the areas where remains of metal production were recovered; a) Western end of the settlement, interpreted as craft area; b) Synagogue complex. In the box, 'Sector Acodo Muralla' showing the location of the combustion structure or furnace (Source: modified after J. A. Arenas)



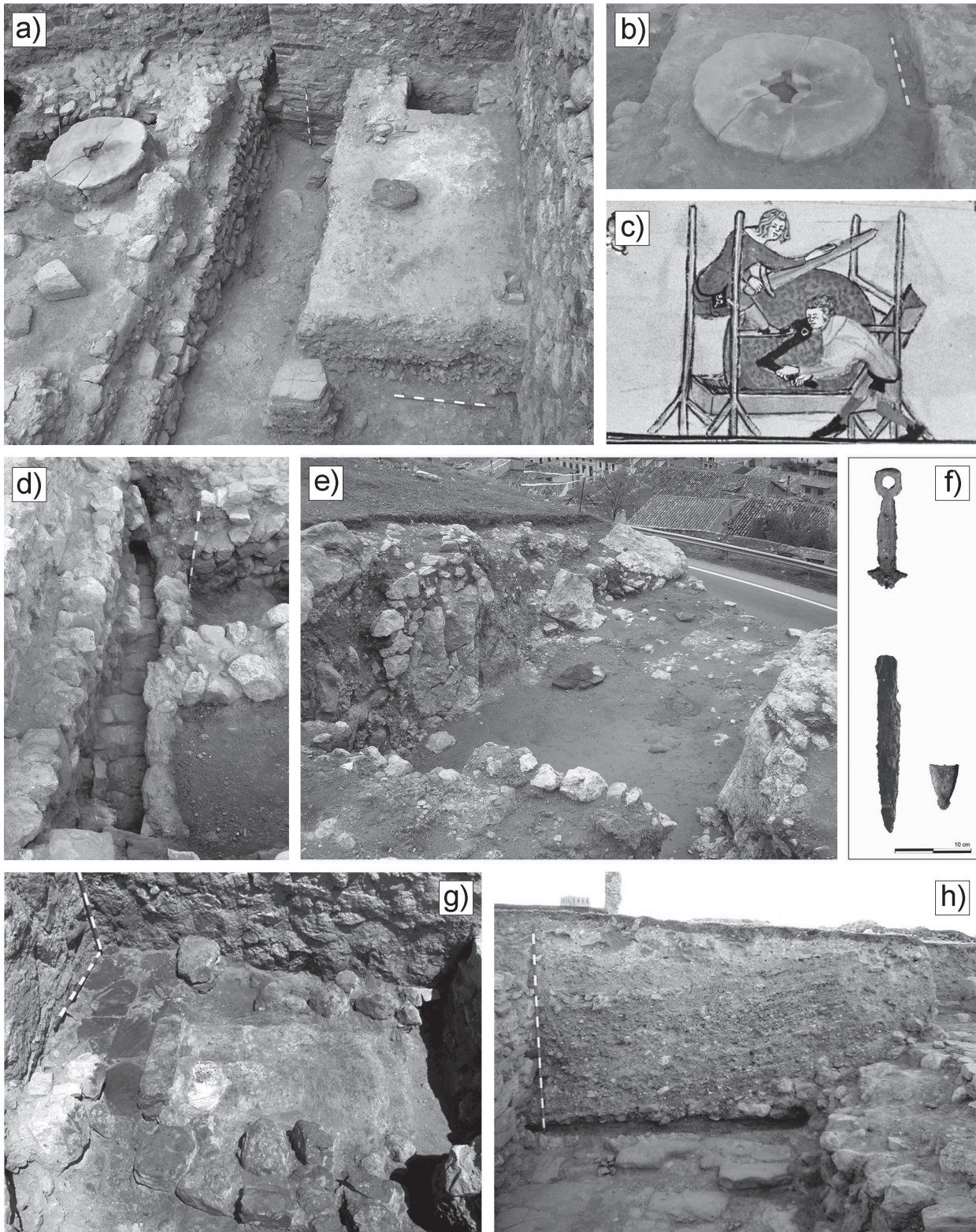


Fig. 9.5. Details of the western craft area of the Jewish quarter; a) Structures J and I-1. b) The sandstone grindstone in structure I-1; c) Workers sharpening a sword with a grinding stone. Romance of Alexander, France (1338–1344). Bodleian Library MS. Bodl. 264, fol. 113v (Source: <https://digital.bodleian.ox.ac.uk/>. CC-BY-NC 4.0); d) Water drainage system next to the sandstone; e) View of Structure H at the end of the excavation (Source: J. A. Arenas); f) The sword found in Structure H. g) Combustion structure or furnace documented in the 'Sector Acodo Muralla' (Source: J. A. Arenas); h) Profile of the western rubbish dump with materials from the 14th–15th century (Source: J. A. Arenas)



as copper ore, abundant slags and glass droplets (Arenas *et al.* 2007, 751; Hernández-Casas 2024, 283–287). The area also included two tile platforms with traces of fire, iron fragment and slags (Structure H), and a sword with a disc pommel, among other iron artefacts (Arenas 2003, 29) (Fig. 9.5e and f). All of this led to the conclusion that the area was used as a workshop (Arenas 2003, 24 and 29; Arenas *et al.* 2007, 715).

To this we must add the remains found in ‘Sector Acodo Muralla’ (Fig. 9.4b). Beneath the pavement that led into the synagogue, built between the 13th and 14th centuries, and abutting the 13th-century wall, there was a rectangular earth platform covered by tiles. The remains of a small combustion chamber, which was probably used for complex metalworking operations, were identified in one of the platform’s ends (Arenas 2003, 20) (Fig. 9.5g). Near this space, inside a tower in the wall (Structure A), several fragments of metal residue were also found inside a 12th-century deposit (Arenas 2003, 20; Hernández-Casas 2024, 294).

The area was abandoned between the late 14th and the first quarter of the 15th century. Both the written and archaeological records indicate that this coincided with the widespread pogroms and massive conversions of 1391 (Cantera Montenegro 1983, 63; Arenas and Martínez 2004, 445; Arenas *et al.* 2007, 720; Arenas 2017, 51). The extraordinary state of preservation of the polychromed plaster decorations inside the synagogue strongly suggests a rapid and likely violent collapse, which has protected them against weathering and erosion (Arenas and Martínez 2004, 445; Arenas *et al.* 2007, 720; Arenas 2008, 38). Similarly, the western rubbish dump includes material dated to the 14th and 15th centuries, and also appears to respond to a rapid deposit aimed at making the space unusable (Arenas 2017, 50) (Fig. 9.5h). This would also explain the abundant elements of material culture found within it, which reflects a swift abandonment of the area (Fig. 9.6). The entity of construction materials (e.g. gypsum decorations and tiles) and other elements of material culture (e.g. luxury imported ceramics, rich metal objects, abundant coins, etc.) indicates a wealthy community, with important cultural and commercial ties. Despite the large number of metal objects found in the Jewish quarter (*vid.* Hernández-Casas 2024, 299–321), the best evidence for metallurgical activity consists of fragments of production waste (ores, slags and other residues).

### Archaeometallurgical characterisation of metal production residues

#### *Copper minerals, from stratigraphy to local landscape ores*

Small fragments of copper ore were included among the materials found in Structures J, I–2, and E, in strata spanning the 12th and 15th centuries (Fig. 9.7a). They present vivid blue and greenish-blue colours and, interestingly, some are

macroscopically very similar to ores documented in Mina La Estrella, in Pardos.

#### *Mineralogical characterisation*

The semiquantitative pXRF elemental analysis revealed that MMM\_7 included Cu (9.74–25.60%), significant values for Fe (3.41–5.87%), Pb (2.52–4.24%), As (1.05%), and Sb (5.41–6.92%), and traces of Ag (0.10%), in line with the geological samples analysed in Pardos (Table 9.1). Sample MMM\_8, a strong indigo blue colour, contained a large concentration of Cu (24.43%) and traces of Fe (0.10%), As (0.04%) and Pb (0.16%). Sample MMM\_9 is almost pure copper (96.20% Cu), with some Sb (1.49%) and Pb (1.76%) and traces of Fe (0.14%).

These compositions are in line with the mineralogical characterisation of the samples by XRD (Plate 9.3); MMM\_7 is shown to contain quartz, azurite, malachite, bindheimite, and segnitite; sample MMM\_8, quartz and azurite; sample, MMM\_9, bindheimite and some azurite, as well as brochantite ( $\text{Cu}_2+4\text{SO}_4(\text{OH})_6$ ), a copper sulphate also detected in the minerals exploited in Pardos (*cf.* Vilaltella *et al.* 2019, 627).

#### *The question of provenance: lead isotopes analysis*

A substantial gap in our understanding of geological and artefactual samples in the area under study (*cf.* García *et al.* 2021; Montero 2018) led us to carry out the isotopic characterisation of the landscape, specifically of Mina La Estrella de Pardos (Table 9.2), owing to the discovery of similar samples there and in the archaeological sequence of the Jewish quarter. Lead Isotopes Analysis (LIA) were conducted by Inductively Coupled Plasma Mass Spectrometry (MC-ICP-MS) at the SGiker (UPV/EHU). This work was undertaken with the support of the staff of Geoparque Molina-Alto Tajo.

The results were compared with published isotopic ratios from other mining districts (see Hernández-Casas 2024 for detailed methodology and references): 207Pb/204Pb versus 206Pb/204Pb, 208Pb/204Pb versus 206Pb/204Pb, 208Pb/206Pb versus 207Pb/206Pb, and 206Pb/204Pb versus 207Pb/206Pb (Plate 9.5). For a probable provenance to be suggested, the dispersion of the samples must match in all scatter graphs (Gener *et al.* 2014, 159). Copper minerals from Pardos present fairly homogeneous ratios, ranging from 18.5045 to 18.5544 (206Pb/204Pb), 15.7117 to 15.7208 (207Pb/204Pb) and 38.8811 to 38.9269 (208Pb/204Pb). In all scatter graphs, the samples form tight clusters, clearly distinct from those yielded by other Iberian mining districts exploited from prehistory and the Roman period (e.g. Linares, the Pyrite Belt, Cartagena/Mazarrón, Catalan Coastal Range).

For their part, the archaeological samples from the Jewish quarter yield results ranging from 18.5308 to 18.5405 (206Pb/204Pb), 15.7134 to 15.7172 (207Pb/204Pb), and





Fig. 9.6. Examples of the metallic objects found in the stratigraphic sequence of the Jewish quarter of Molina (12th to 15th centuries); a) Some iron artefacts (horseshoes, buckles, key, arrowhead); b) Some copper-based artefacts (buckles and brooches, ornaments, rings, thimbles)

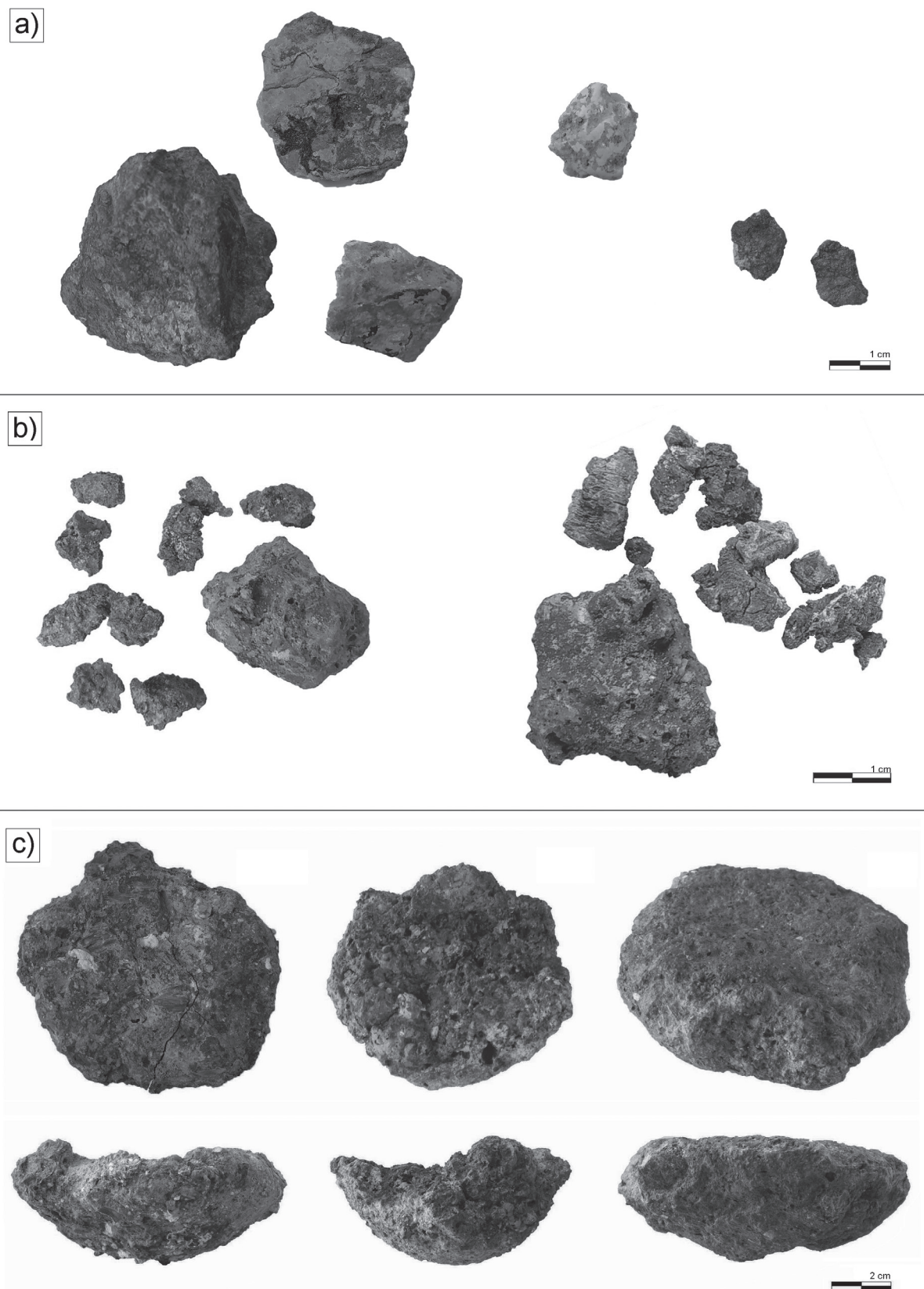


Fig. 9.7. Metal production residue from the Jewish quarter analysed in this study; a) Copper minerals; b) Silver production residue; c) Iron forging hearth bottoms

Table 9.2. Results of the MC-ICP-MS lead isotope analysis of selected copper minerals from Castil de los Judíos, compared with data from the isotopic characterisation of Mina La Estrella (Pardos). Carried out at the Servicio General de Geocronología y Geoquímica Isotópica (UPV). Technical description in Rodríguez et al. (2020)

| Sample                           | $^{206}\text{Pb}/^{204}\text{Pb}$ | 2 SD   | $^{207}\text{Pb}/^{204}\text{Pb}$ | 2 SD   | $^{208}\text{Pb}/^{204}\text{Pb}$ | 2 SD   | $^{208}\text{Pb}/^{206}\text{Pb}$ | 2 SD    | $^{207}\text{Pb}/^{206}\text{Pb}$ | 2 SD    |
|----------------------------------|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|---------|-----------------------------------|---------|
| <b>La Estrella Mine (Pardos)</b> |                                   |        |                                   |        |                                   |        |                                   |         |                                   |         |
| MMM_1                            | 18.5045                           | 0.0011 | 15.7184                           | 0.0010 | 38.8811                           | 0.0029 | 2.10118                           | 0.00006 | 0.84944                           | 0.00002 |
| MMM_2                            | 18.5428                           | 0.0011 | 15.7117                           | 0.0011 | 38.9074                           | 0.0028 | 2.09825                           | 0.00005 | 0.84732                           | 0.00002 |
| MMM_3                            | 18.5097                           | 0.0011 | 15.7208                           | 0.0010 | 38.9064                           | 0.0026 | 2.10195                           | 0.00005 | 0.84933                           | 0.00002 |
| MMM_4                            | 18.5544                           | 0.0013 | 15.7190                           | 0.0012 | 38.9269                           | 0.0031 | 2.09799                           | 0.00005 | 0.84719                           | 0.00002 |
| MMM_5                            | 18.5465                           | 0.0012 | 15.7176                           | 0.0011 | 38.9188                           | 0.0031 | 2.09845                           | 0.00006 | 0.84747                           | 0.00002 |
| MMM_6                            | 18.5485                           | 0.0011 | 15.7167                           | 0.0010 | 38.9230                           | 0.0029 | 2.09845                           | 0.00006 | 0.84733                           | 0.00002 |
| <b>Castil de los Judíos</b>      |                                   |        |                                   |        |                                   |        |                                   |         |                                   |         |
| MMM_7                            | 18.5375                           | 0.0011 | 15.7167                           | 0.0010 | 38.9102                           | 0.0028 | 2.0990                            | 0.00005 | 0.8478                            | 0.00001 |
| MMM_8                            | 18.5308                           | 0.0014 | 15.7172                           | 0.0012 | 38.9289                           | 0.0030 | 2.1008                            | 0.00009 | 0.8482                            | 0.00003 |
| MMM_9                            | 18.5405                           | 0.0013 | 15.7134                           | 0.0012 | 38.9115                           | 0.0033 | 2.0987                            | 0.00005 | 0.8475                            | 0.00001 |

38.9102 to 38.9289 ( $^{208}\text{Pb}/^{204}\text{Pb}$ ), which are fairly homogeneous and free from excessively radiogenic values (Table 9.2). In the scatter graphs they feature close to the geological samples from Pardos (Plate 9.5). This strongly suggests that the minerals analysed in Castil de los Judíos came from Pardos, indicating that the lords of Molina exploited the mine sometime between the 12th and 15th centuries.

### Silver production residues: A possible case of liquation?

Other metalworking remains were identified in Structure A, in association with the combustion feature found abutting the 13th-century wall, interpreted by the excavators as a feature related to metalworking operations of some complexity (Arenas 2003, 20). These were small irregular fragments, greenish in colour and fairly heavy: 15.633 gr the first assemblage (027) and 22.37 gr the second (028) (Fig. 9.7b). The greenish-bluish surface is characteristic of copper corrosion, indicating the presence of this metal; however, the considerable weight of these lumps also suggested a significant lead content.

Two samples were analysed by SEM-EDS to establish their microstructure and the chemical composition of the various phases present. Compositionally, the most abundant compound is PbO (70.7–85.9%), followed by SiO<sub>2</sub> (7.4–7.9%), CaO (5.1–9.3%) and smaller quantities of MgO, Al<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MnO, FeO, CuO, As<sub>2</sub>O<sub>5</sub> and Sb<sub>2</sub>O<sub>3</sub> (Table 9.3). In terms of microstructure, the main phase in both samples is a matrix of almost pure PbO, including the growth of acicular PbO laths (Fig. 9.8a, b, d, f and g). Also detected were polygonal crystals of variable size, perhaps the result of contamination from the combustion structure, as suggested by their SiO<sub>2</sub> and CaO contents, as well as

small carbon/ceramic particles, as indicated by their Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> and K<sub>2</sub>O contents (Fig. 9.8b, c and e). Finally, a mostly globular CuO phase in the form of only partially oxidised cuprite was deposited in a liquid state over the PbO-rich matrix (Fig. 9.8c, f and h). The analysis also detected the occasional geometric crystal, solidified at the same time as the PbO (Fig. 9.8g).

These results confirm that these fragments correspond to silver cupellation waste, a system that oxidises Pb-rich metal at high temperatures to separate them from precious metals, such as silver, in a pit, a furnace or a porous mobile container (cupel) – typically made in a lime or/and ash-rich material – under oxidising conditions (Martínón-Torres *et al.* 2009; Girbal 2011; Merkel 2021; Saussus *et al.* 2022). As the lead (PbO, litharge) and other base metals (e.g. CuO, SnO<sub>2</sub>) present in the ore oxidise, they are absorbed by the cupel or precipitate to the bottom, while precious metals – in this case silver – remain on the surface, as they are more resistant to oxidation and are sustained by their higher surface tension (Bayley and Eckstein 2006, 145–146).

Cupellation can be related to three different activities: (1) silver production; (2) silver recycling or remelting; and (3) small-scale assaying (Bayley and Eckstein 1997, 107; Bayley 2008, 133–138). In all instances, the elements form two groups. First, oxides resulting from the metallurgical use of the cupel, usually from elements with higher atomic weight than Ni (PbO, CuO, As<sub>2</sub>O<sub>5</sub>, Sb<sub>2</sub>O<sub>3</sub>). Second, oxides related to the raw materials used to make the combustion structure or the cupel, with lower atomic weight than Ni (SiO<sub>2</sub>, CaO, Al<sub>2</sub>O<sub>3</sub>, MgO, MnO, K<sub>2</sub>O) (Martínón-Torres *et al.* 2009, 437).

In the former, CuO stands out (in addition to PbO) (Table 9.3). The presence of CuO in litharge typically suggests the



Table 9.3. Results of SEM-EDS analysis of silver production residues from Castil de los Judíos. Values expressed as normalized oxide wt%. Analysis carried out at MicroLab, CCHS (CSIC, Madrid). Technical description in Rovira Llorens and Montero Ruiz (2018)

| Analysis area                                                                  | Na <sub>2</sub> O | MgO    | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | P <sub>2</sub> O <sub>5</sub> | SO <sub>3</sub> | K <sub>2</sub> O | CaO    | Mn    | FeO   | NiO | CuO    | As <sub>2</sub> O <sub>3</sub> | Ag <sub>2</sub> O | Sb <sub>2</sub> O <sub>3</sub> | PbO    |
|--------------------------------------------------------------------------------|-------------------|--------|--------------------------------|------------------|-------------------------------|-----------------|------------------|--------|-------|-------|-----|--------|--------------------------------|-------------------|--------------------------------|--------|
| <b>SAMPLE_027</b>                                                              |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| <b>Bulk</b>                                                                    |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 2)                                                                   | nd                | 0.8    | 2.6                            | 7.4              | nd                            | nd              | 1.1              | 5.1    | nd    | nd    | nd  | 4.0    | nd                             | nd                | nd                             | 79.1   |
| Std Dev.                                                                       | nd                | 1.068  | 1.662                          | 2.447            | nd                            | nd              | 0.191            | 4.243  | nd    | nd    | nd  | 0.042  | nd                             | nd                | nd                             | 9.652  |
| <b>PbO matrix</b>                                                              |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 7)                                                                   | nd                | 0.5    | 0.5                            | 1.0              | nd                            | nd              | nd               | 0.2    | nd    | nd    | nd  | 1.7    | nd                             | nd                | 1.0                            | 94.7   |
| Std Dev.                                                                       | nd                | 0.892  | 1.126                          | 1.772            | nd                            | nd              | nd               | 0.401  | nd    | nd    | nd  | 1.670  | nd                             | nd                | 2.041                          | 3.977  |
| <b>PbO laths</b>                                                               |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 3)                                                                   | nd                | nd     | nd                             | 0.0              | nd                            | nd              | nd               | 0.1    | nd    | nd    | nd  | 1.1    | nd                             | nd                | nd                             | 98.8   |
| Std Dev.                                                                       | nd                | nd     | nd                             | 0.029            | nd                            | nd              | nd               | 0.150  | nd    | nd    | nd  | 0.641  | nd                             | nd                | nd                             | 0.696  |
| <b>PbO + SiO<sub>2</sub> &amp; CaO</b>                                         |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 7)                                                                   | 0.2               | 0.5    | 0.1                            | 15.4             | nd                            | nd              | nd               | 11.5   | nd    | 0.1   | nd  | 0.1    | nd                             | nd                | nd                             | 71.7   |
| Std Dev.                                                                       | 0.278             | 0.630  | 0.129                          | 1.414            | nd                            | nd              | nd               | 1.298  | nd    | 0.251 | nd  | 0.246  | nd                             | nd                | nd                             | 1.962  |
| <b>PbO + Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub> &amp; K<sub>2</sub>O</b> |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 3)                                                                   | nd                | 0.0    | 22.7                           | 27.5             | nd                            | nd              | 23.3             | nd     | nd    | 0.2   | nd  | 0.5    | nd                             | nd                | nd                             | 25.8   |
| Std Dev.                                                                       | nd                | 0.075  | 3.138                          | 4.481            | nd                            | nd              | 3.385            | nd     | nd    | 0.197 | nd  | 0.447  | nd                             | nd                | nd                             | 11.292 |
| <b>CuO</b>                                                                     |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| X Mean (n = 3)                                                                 | nd                | 0.8    | 0.5                            | nd               | nd                            | nd              | nd               | 0.1    | nd    | nd    | nd  | 96.4   | nd                             | nd                | nd                             | 2.2    |
| Std Dev.                                                                       | nd                | 0.7208 | 0.8314                         | nd               | nd                            | nd              | nd               | 0.0924 | nd    | nd    | nd  | 2.4837 | nd                             | nd                | nd                             | 1.236  |
| <b>CaO with Sb<sub>2</sub>O<sub>3</sub></b>                                    |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 2)                                                                   | nd                | 3.5    | 6.8                            | 1.9              | 0.2                           | nd              | nd               | 28.5   | 0.5   | 9.6   | nd  | 0.2    | nd                             | nd                | 30.9                           | 17.8   |
| Std Dev.                                                                       | nd                | 0.799  | 0.262                          | 0.085            | nd                            | nd              | nd               | 1.718  | 0.113 | 2.093 | nd  | 0.099  | nd                             | nd                | 0.332                          | 1.435  |
| <b>SAMPLE_028</b>                                                              |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| <b>Bulk</b>                                                                    |                   |        |                                |                  |                               |                 |                  |        |       |       |     |        |                                |                   |                                |        |
| Mean (n = 2)                                                                   | nd                | 3.9    | 1.2                            | 7.9              | nd                            | nd              | 0.2              | 4.6    | nd    | 0.2   | nd  | 2.6    | nd                             | nd                | 1.9                            | 77.2   |
| Std Dev.                                                                       | nd                | 3.486  | 0.481                          | 2.326            | nd                            | nd              | 0.262            | 6.555  | nd    | 0.235 | nd  | 0.601  | nd                             | nd                | 2.666                          | 9.199  |

(Continued)

Table 9.3. Results of SEM-EDS analysis of silver production residues from Castil de los Judios. Values expressed as normalized oxide wt%. Analysis carried out at MicroLab, CCHS (CSIC, Madrid). Technical description in Rovira Llorens and Montero Ruiz (2018) (Continued)

| Analysis area                                                                      | Na <sub>2</sub> O | MgO   | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | P <sub>2</sub> O <sub>5</sub> | SO <sub>3</sub> | K <sub>2</sub> O | CaO   | Mn | FeO   | NiO   | CuO    | As <sub>2</sub> O <sub>3</sub> | Ag <sub>2</sub> O | Sb <sub>2</sub> O <sub>3</sub> | PbO    |
|------------------------------------------------------------------------------------|-------------------|-------|--------------------------------|------------------|-------------------------------|-----------------|------------------|-------|----|-------|-------|--------|--------------------------------|-------------------|--------------------------------|--------|
| <b>PbO</b>                                                                         |                   |       |                                |                  |                               |                 |                  |       |    |       |       |        |                                |                   |                                |        |
| Mean ( <i>n</i> = 4)                                                               | nd                | 0.6   | 1.4                            | 7.3              | nd                            | nd              | nd               | 1.7   | nd | 0.4   | nd    | 2.2    | nd                             | nd                | 1.1                            | 85.4   |
| Std Dev.                                                                           | nd                | 0.570 | 1.334                          | 6.737            | nd                            | nd              | nd               | 2.898 | nd | 0.491 | nd    | 3.487  | nd                             | nd                | 1.957                          | 10.261 |
| <b>PbO laths</b>                                                                   |                   |       |                                |                  |                               |                 |                  |       |    |       |       |        |                                |                   |                                |        |
| Mean ( <i>n</i> = 6)                                                               | nd                | 1.4   | 0.5                            | 7.9              | nd                            | nd              | nd               | 1.5   | nd | 0.1   | nd    | 1.3    | nd                             | nd                | 0.8                            | 84.9   |
| Std Dev.                                                                           | nd                | 0.792 | 0.472                          | 3.972            | nd                            | nd              | nd               | 1.846 | nd | 0.139 | nd    | 1.588  | nd                             | nd                | 1.841                          | 3.145  |
| <b>PbO + Al<sub>2</sub>O<sub>3</sub>,<br/>SiO<sub>2</sub> &amp; K<sub>2</sub>O</b> |                   |       |                                |                  |                               |                 |                  |       |    |       |       |        |                                |                   |                                |        |
| Mean ( <i>n</i> = 2)                                                               | nd                | nd    | 24.6                           | 30.4             | nd                            | nd              | 23.4             | nd    | nd | nd    | nd    | nd     | nd                             | nd                | nd                             | 21.6   |
| Std Dev.                                                                           | nd                | nd    | 4.830                          | 4.228            | nd                            | nd              | 4.221            | nd    | nd | nd    | nd    | nd     | nd                             | nd                | nd                             | 13.287 |
| <b>CuO</b>                                                                         |                   |       |                                |                  |                               |                 |                  |       |    |       |       |        |                                |                   |                                |        |
| Mean ( <i>n</i> = 8)                                                               | nd                | 0.5   | nd                             | nd               | nd                            | 0.3             | nd               | nd    | nd | nd    | 0.0   | 88.3   | 3.3                            | 0.2               | 2.1                            | 4.7    |
| Std Dev.                                                                           | –                 | 1.498 | –                              | 0.000            | 0.000                         | 0.863           | –                | –     | –  | –     | 0.117 | 10.186 | 6.606                          | 0.495             | 4.035                          | –      |
| <b>PbO in CuO<br/>phases</b>                                                       |                   |       |                                |                  |                               |                 |                  |       |    |       |       |        |                                |                   |                                |        |
| Mean ( <i>n</i> = 7)                                                               | nd                | nd    | 0.8                            | 0.0              | nd                            | nd              | nd               | nd    | nd | nd    | nd    | 16.1   | 1.6                            | nd                | 5.2                            | 76.4   |
| Std Dev.                                                                           | nd                | nd    | 1.245                          | 0.036            | nd                            | nd              | nd               | nd    | nd | nd    | nd    | 21.632 | 3.470                          | nd                | 10.707                         | 21.832 |

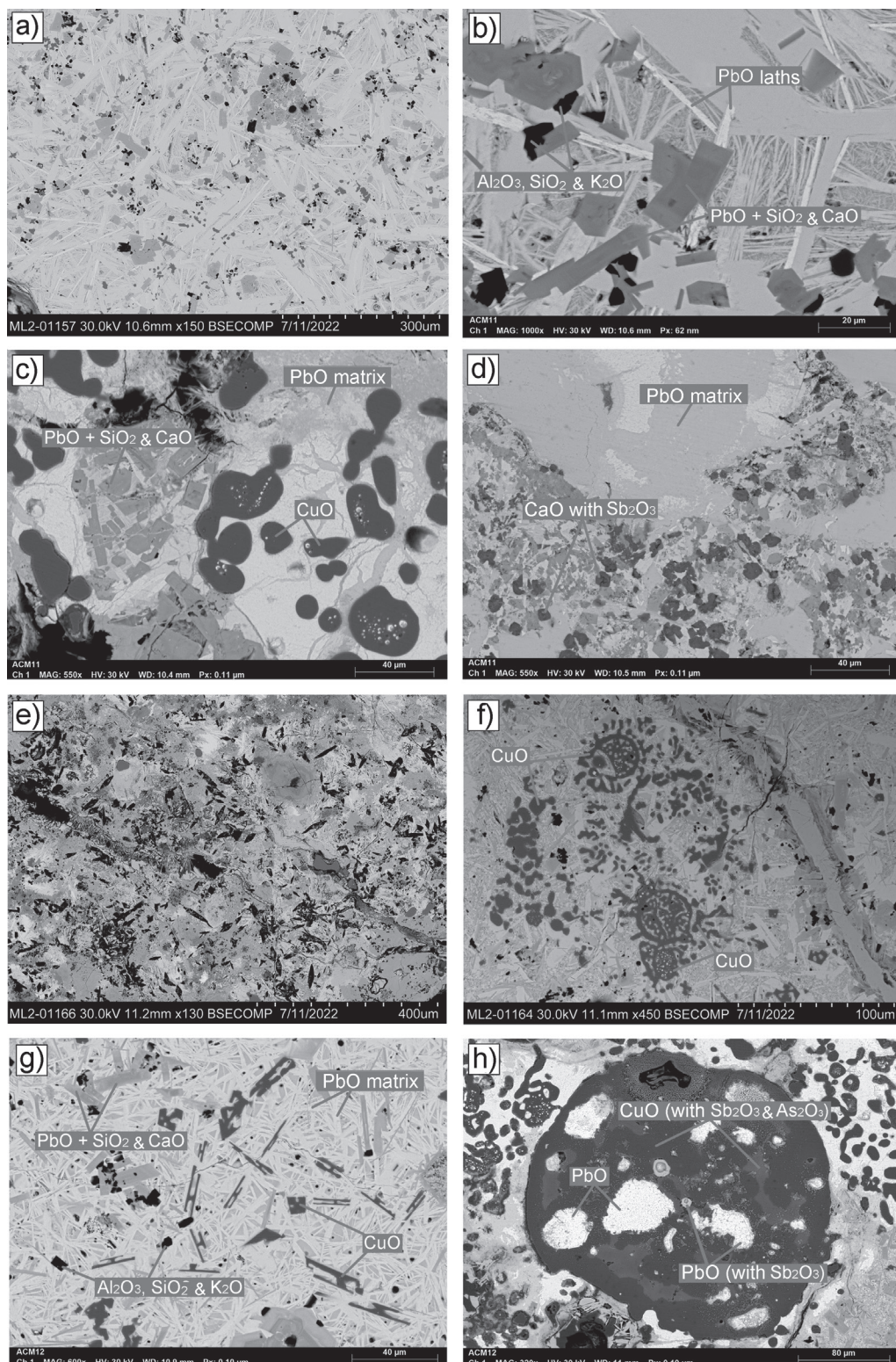


Fig. 9.8. SEM-EDS micrographs of silver production residues 027 (a–d) and 028 (e–h) from the Jewish quarter of Molina. Backscattered electrons (BSE); a) General view with PbO phases and ceramic material; b) PbO laths with  $\text{SiO}_2$  and CaO, charcoal and PbO laths; c) Detail of some CuO in the PbO matrix, with  $\text{SiO}_2$  and CaO crystals; d) PbO matrix and CaO formations that have absorbed some  $\text{Sb}_2\text{O}_3$  in sample 027; e) General view of ceramic material with PbO phases; f) CuO phases over the PbO laths and matrix; g) CuO crystals, PbO laths and different phases related to ceramic material and additives; h) Detail of CuO phase with trapped PbO and contents of  $\text{As}_2\text{O}_3$  and  $\text{Sb}_2\text{O}_3$ . Analysis carried out at MicroLab, CCHS (CSIC, Madrid)



recycling of silver-copper alloy items to separate the silver. However, the copper can also be the result of ore processing. The high PbO:CuO ratio in the bulk compositions reveal the addition of significant quantities of PbO to reduce the formation of free CuO, which can partially dissolve the silver and drag it to the bottom of the cupel. The CuO phases found in the samples support this interpretation, as they would lead to insignificant loss of silver in the samples. These phases – unlike others with greater propensity to absorb Ag – are fairly similar to those present in the crucible load, that is, to the material deposited to extract the silver in the combustion structure; only one analysis of CuO was found to have traces of silver (1.4% Ag<sub>2</sub>O) (Table 9.3). However, heavy metals contents, specifically As<sub>2</sub>O<sub>5</sub> and Sb<sub>2</sub>O<sub>3</sub>, were detected, the latter having been absorbed by PbO and CaO phases.

The waste related to the remelting of copper-silver alloy items is typically a litharge free from heavy elements, with barely any Pb and Cu oxides. Elements such as As<sub>2</sub>O<sub>3</sub> and Sb<sub>2</sub>O<sub>3</sub> – and in one instance SO<sub>3</sub> – should have been lost during the first cupellation, not being present in the material subject to recycling at a later stage. In fact, the Cu:Sb ratio is fairly low in some of the analyses, which suggests that this waste corresponds to an early stage of the *chaîne opératoire* of ore processing, as indicated by the relatively high As and Sb contents. As such, rather than silver cupellation of lead-silver ores – like galena – this waste indicates the extraction of silver from copper-silver ores, a process known as liquation (cf. Dungworth and Nicholas 2004; L'Héritier and Téreygeol 2010; Renzi 2013). Should this be the case, this would be among the earliest archaeological indications of this practice (much more widespread in the Late Middle Ages, as we shall see shortly) in the medieval West.

The normalisation of the bulk analysis results after subtracting the heavy elements (> Ni) allows for the reconstruction of the raw materials used in the fire structure or cupel (cf. Martínón-Torres *et al.* 2009; Hsu and Martínón-Torres 2019; Girbal 2011; Saussus *et al.* 2022). The main components are SiO<sub>2</sub> (35.8–66.6%) and CaO (20.4–34.6%), with significant quantities of Al<sub>2</sub>O<sub>3</sub> (5.9–15.9%), MgO (c. 20%), and K<sub>2</sub>O (up to 9%). The high SiO<sub>2</sub>, CaO, and Al<sub>2</sub>O<sub>3</sub> contents suggest the use of clayey materials, although the concentrations of MgO – too high for most clay compositions – and K<sub>2</sub>O suggest mixing with wood ash. The absence of P<sub>2</sub>O<sub>5</sub> indicates that bone ash was not used. The only data point that includes traces of P could be related to the use of plant ashes (Martínón-Torres *et al.* 2009, 440; Girbal 2011, 34).

Theophilus, writing in the 12th century, reports that cupels had a clayey matrix with added ash (2/3 bone ash; 1/3 beechwood ash) (Hawthorne and Smith 1979, 96–97). A 14th-century anonymous Castilian manuscript, the *Libro que enseña ensayar qualquier moneda*, claims that a 'buena cendrada' required three parts of bone ash and one of vine

shoot ash or, alternatively, 'cauliflower roots' (Caunedo del Potro and Córdoba de la Llave 2000, 123r–123v). The analysis of samples of medieval litharge from Winchester, London, Dublin and York confirm the manufacture of two types of cupels. A 14th-century example from London was made of bone ash, and the main components were CaO and P<sub>2</sub>O<sub>5</sub>. The composition of the remaining specimens (9th–13th centuries) is dominated by SiO<sub>2</sub> and CaO, with small quantities of Al<sub>2</sub>O<sub>3</sub>, MgO, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, that is, a mix of clay and plant ash (Girbal 2011, 31–37).

In Iberia, the only medieval cupels that have been analysed come from the mint of Porto (Portugal) and were used for assaying and cupellation between the 14th and 16th centuries. Their compositions suggest the mix of clay and bone ash, with slightly higher P<sub>2</sub>O<sub>5</sub> contents, perhaps suggesting a greater proportion of bone ash, in the more recent specimens (Hsu and Martínón-Torres 2019, 503). In fact, the few analyses of Late Medieval and Early Modern European cupels available suggest that the use of cupels made with pure bone ash, which allowed for smaller losses of silver, was especially common in mints (cf. Martínón-Torres *et al.* 2009). Castil de los Judíos, however, was not a mint, and the remains analysed ante-date the 14th century. Their composition can be situated in relation to Theophilus's description and the early compositions from Porto. A possible explanation for the use of plant ash in the cupels is the abundance of wood, a key resource for metalworking, in the lordship.

### *Smithing heart bottoms, evidence of an iron forge*

The prominence of ironworking practices in medieval Molina is reflected in the mining landscape and in the abundant iron slags found embedded in the mortar of the castle walls, especially in the western section and the Torre de Aragón (Fig. 9.3b and c). It seems clear that iron was readily available, and that the town controlled the exploitation of mineral ores in its hinterland.

Although some iron reduction remains have been found in the Jewish quarter (*vid.* Hernández-Casas 2024, 388–395), this study focused on the analysis of the forge waste. The specimens described here, three slightly convex/concave flat forge lenses (Fig. 9.7c), were found in the 14th- to 15th-century rubbish dump in the western sector of the site. These lenses form at the base of the forge during the hot-working of iron ingots, bars and other objects over an anvil. Their composition combines that of the iron and the possible impurities left in it during working and the result of contamination from the furnace walls and the fluxes used (Serneels and Perret 2003, 471; Rovira Llorens 2007, 103; Rovira and Renzi 2010, 118).

They correspond to Serneels and Perret's (2003) hemispheric type, and all of them are almost fully preserved. Their weight ranges from 323.86 to 462.58 gr. Their ellipticity is nearly  $E = 1$ , as they are almost perfectly round

in shape. Their flatness is  $F > 1$ , although two of them are slightly concave/convex and the other one flat/convex. Their profile can be related to their position inside the forge and with regard to the air flux of the tuyere. They all appear to have occupied a more or less central position within the combustion area, which explains their circular shape. However, with regard to the tuyere, their position seems to have varied. While the convex/concave profile of specimens 024 and 025 suggests a perpendicular air flow, leaving a central mark, the flat profile of specimen 026 indicates a parallel air flow and much greater proximity to the tuyere (Serneels and Perret 2003, 473–475). The mark left by the air flow (Fluzin and Dillmann 2012, 14) suggests a tuyere 3 cm in diameter or under.

SEM-EDS analysis revealed the formation of nodular wüstite, suggesting working temperatures well below the 1300–1350°C required for iron reduction but sufficient for thermo-mechanical ironworking at the forge (Fig. 9.9a, b and d). Two of them (025 and 026) present hammerscale, a highly diagnostic component of forge iron (Fig. 9.9c–f). Hammerscale are flakes of FeO that form during hammering, indicating a late step in the iron's *chaîne opératoire*, probably the final shaping of iron objects (cf. Dungworth and Wilkes 2009, 33–35; Rovira and Renzi 2010, 118; Renzi and Montero 2013, 79–80). Interstitial glass, in the form of CaO-rich iron silicates close to fayalite, intertwined with abundant phases of olivine, similar to kirschsteinite ( $\text{CaFeSiO}_4$ ), is barely present (Fig. 9.9b and c).

During forging, lime was added as flux, as suggested by the high CaO contents of the bulk analysis, perhaps in addition to the use of Ca-rich iron minerals (Table 9.4). It is worth recalling that the main iron source for Molina was Sierra Menera, where the main iron deposits sit between limestones and Ordovician dolomites. In fact, during our visits we attested numerous instances of yellow-tinted limestones, a typical feature of iron absorption, although the high CaO values attested in several slag samples from Saletas, likely the result of the use of a lime-rich iron ore found in the stratigraphy, is even more interesting (Fabre *et al.* 2012, 51). Lens 025 was also found to contain some iron sulphates and probably some unreduced pyrite relicts.

In addition to the flat-convex profiles, the working temperatures inferred from the presence of nodular wüstite, the presence of hammerscale, and the high CaO contents, the analyses detected several  $\text{Al}_2\text{O}_3$  – and  $\text{SiO}_2$  – rich non-melted embedded minerals. These must be associated with the addition of handfuls of sand during the forging process, also as a flux. Finally, the use of firewood as fuel, of which small fragments were identified, is responsible for the high K<sub>2</sub>O contents. The high  $\text{SiO}_2$  and CaO contents found are also typical of smithing slag (e.g. Serneels and Perret 2003, 472; Rovira 2007, 103).

## Discussion and final considerations

The discovery in Molina's Jewish quarter of metallic minerals, slags and a large number of iron and copper-alloy objects, as well as the workshop features, clearly point to significant metallurgical activity in the town between the 12th and 15th century. The archaeometallurgical analysis of the remains has improved our understanding of economic dynamics in the manor. As such, it is now possible to argue that Molina de Aragón was the capital of a feudal lordship in which mining, metalworking and trade in metals were key economic activities, as already indicated by the written sources and the abundant mineral resources present in the landscape.

Based on compositional, mineralogical and, especially, isotopic affinity, the copper minerals found in the stratigraphy of Castil de los Judios appear to have been sourced locally, specifically from Mina La Estrella de Pardos, which clearly indicates that the mine was exploited between the 12th and 15th century. However, we have found no archaeometric evidence for copper reduction or working in the Jewish quarter. In Molina, copper was used in the textile and hides industries, as a colourant, in the form of blue copperas, a copper sulphate (Cortés 2000, 946–947), and also used as a colourant (blue and green) in ceramic glazes (e.g. Salinas and Pradell 2020) and glass (e.g. De Ares and Schibille 2017).

On the other hand, there is evidence for silver production, and this may be behind the discovery of minerals from Pardos at the site. Although further isotopic analysis is needed, it is worth recalling that Pardos contains rich deposits of copper-silver minerals. Archaeological evidence for the liquation of silver out of these minerals in the Middle Ages is rare (e.g. Dungworth and Nicholas 2004; L'Héritier and Téreygeol 2010; Renzi 2013). The earliest written mention of this technique is found in Su Sung's *Pen Tschao Thu Ching*, a Chinese treatise dated to 1061. The treatise mentions that silver was extracted from copper-silver ores by adding lead and repeatedly heating the mix (Needham 1974, 60; Renzi 2013, 217). The adoption of this technique, known as *saigerprozess* (L'Héritier and Téreygeol 2010), in Europe has traditionally been dated to the 15th and 16th centuries, based on the date of publication of technical treatises such as Biringuccio's (Carrasco Galán *et al.* 2010) and Georgius Agricola's (Hoover and Hoover 1950).

However, some authors argue that the technique may have been known in Europe as early as the 13th century, based on the analytical results yielded by a number of containers, which are reminiscent of *caldarium*, a type of lead-rich bronze with significant Sb – and, to a lesser extent, As and Ag – impurities, which results from the separation of silver and copper (Dungworth and Nicholas 2004). Archaeological evidence in Iberia is limited to a few fragments of production waste from La Fonteta (Guardamar del Segura, Alicante), which have been tentatively linked to this process, although they are dated to the 1st



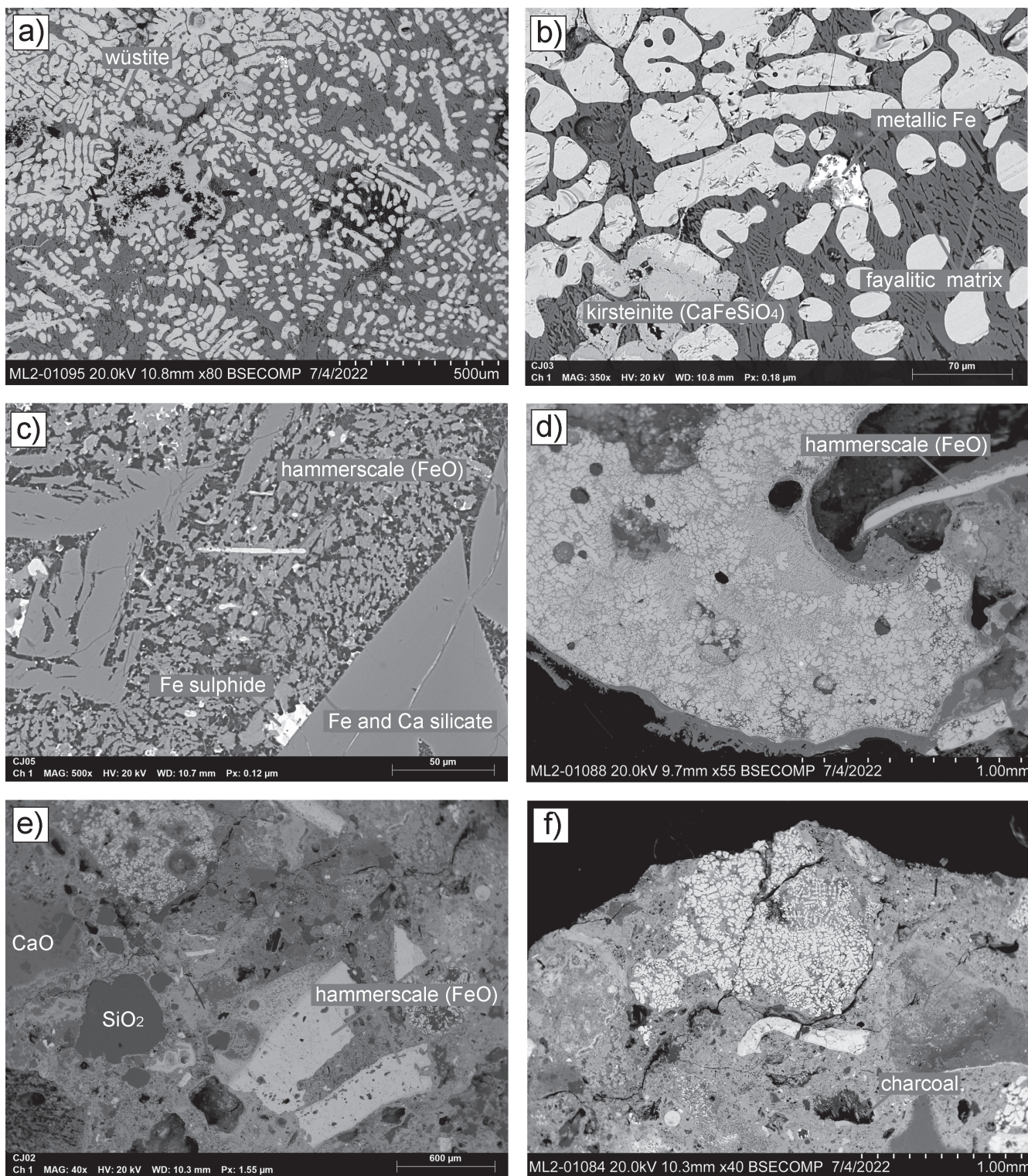


Fig. 9.9. SEM-EDS micrographs of the iron forging hearth bottoms from the Jewish quarter of Molina. Backscattered electrons (BSE); a) Abundant globular wüstite in sample 024; b) Detail of the microstructure of sample 024, with a metallic Fe inclusion, the fayalitic matrix and kirsteinite phases; c) Detail of sample 025 with some hammerscale, Fe and Ca silicates and a Fe sulphide; d) General view of sample 026 with globular wüstite and hammerscale; e) Sample 026 with hammerscale and phases of  $\text{SiO}_2$  and  $\text{CaO}$  added to the system; f) General view of sample 026 with Fe silicates, hammerscale and charcoal. Analysis carried out at MicroLab, CCHS (CSIC, Madrid)



Table 9.4. SEM-EDS bulk compositions of the three iron forging hearth bottoms from Castil de los Judíos. Values expressed as normalized oxide wt%. Analysis carried out at MicroLab, CCHS (CSIC, Madrid). Technical description in Rovira Llorens and Montero Ruiz (2018)

| Sample     | Na <sub>2</sub> O | MgO   | Al <sub>2</sub> O <sub>3</sub> | SiO <sub>2</sub> | P <sub>2</sub> O <sub>5</sub> | SO <sub>3</sub> | K <sub>2</sub> O | CaO   | TiO <sub>2</sub> | MnO   | FeO    |
|------------|-------------------|-------|--------------------------------|------------------|-------------------------------|-----------------|------------------|-------|------------------|-------|--------|
| <b>024</b> | nd                | 11.6  | 3.2                            | 16.4             | nd                            | 0.4             | 0.9              | 9.2   | nd               | nd    | 68.4   |
| <b>025</b> | 0.4               | 1.7   | 6.4                            | 25.4             | 0.5                           | 1.4             | 3.2              | 19.5  | 0.5              | nd    | 41.0   |
| <b>026</b> | 0.7               | 2.2   | 9.4                            | 15.7             | 1.0                           | 1.1             | 1.1              | 7.0   | nd               | 1.8   | 59.7   |
| Mean       | 0.4               | 5.2   | 6.3                            | 19.2             | 0.5                           | 1.0             | 1.7              | 11.9  | 0.2              | 0.6   | 56.4   |
| Std Dev.   | 0.351             | 5.577 | 3.101                          | 5.410            | 0.500                         | 0.513           | 1.274            | 6.673 | 0.289            | 1.039 | 14.001 |

millennium BC, well before the Middle Ages (cf. Renzi 2013, 216–220). For the medieval period, the archaeological evidence is negligible, beyond a large oval ingot found in Mulli (Finland), dated to between 980 and 1120, and an assemblage of lead lenses found in a metalworking area in Rausi (Latvia), dated to the 11th–12th century (L'Héritier and Téreygeol 2010, 137).

On the other hand, the discovery of forge lenses clearly shows that ironworking took place at the site. These are among the few specimens of forge waste to have been archaeometallurgically analysed in the Iberian Peninsula, alongside those found in the excavation of Saint Mary's cathedral, in Vitoria (Basque Country), dated to the 9th–11th century (Renzi and Montero 2013). The archaeological confirmation of iron forging in Castil de los Judíos – the excavation of which, it is worth recalling, yielded abundant iron items (e.g. keys, horseshoes, weapons, buckles, etc.) – likely suggests other ironworking-related activities, such as knife and sword sharpening. To this we must add the discovery *in situ* of a large sandstone block and the proximity of an underground water pipe.

The high technical skill that can be inferred from the analysis of slags and other metallurgical remains is confirmed by the written record. In this, mention is made of numerous metal-related trades, such as farriers, locksmiths, cutlers, ironsmiths, smelters, coppersmiths and bellmakers (cf. Pérez 1992, 197; Cortés 2000, 944; Barrios 2017, 225). This suggests specialisation in terms of type of production and position in the *chaîne opératoire*, including the Basque miners that took over the iron mills in the Late Middle Ages (Cortés 2000, 1017).

Before closing, it is worth considering the distribution of craft areas in the town's layout. It was common for metallurgical activities to cluster closely together, as shown by archaeology in other western medieval contexts (e.g. Bruttini and Grassi 2010; Saussus 2019). Iberian examples include the forges of Albalat and the metal workshop in the village of L'Esquerda, dated to the 12th–13th century, where copper and iron were likely worked together (cf. Gilotte and Cáceres 2017; Amblàs Novellas *et al.* 2008); in the Jewish quarter of Molina, metalworking involved, at least, iron forging and silver working.

Finally, we must examine the cultural/ethnic identity of metalworkers in the Iberian feudal kingdoms, specifically,

the role played by Jews in the production and sale of metal objects. The written record attests that a significant proportion of urban craftspeople in the crowns of Castile and Aragón were Jews (Fig. 9.10). Their most usual trades were related to the production of textiles – weavers, tailors, dyers, silk producers – and metal, including ironsmiths and silversmiths (Hinojosa 1992, 99–101). In Seville, for instance, there is evidence for the activity of ironsmiths – some of which specialised in spears – silversmiths and gilders (Montes Romero-Camacho 1988, 564–565); in Catalonia, there are abundant generic references to ironsmiths, but also to steel-makers, cutlers, scale-makers and silversmiths (Romano Ventura 1989, 52; Madurell y Marimón 1967); in the Kingdom of Valencia, silversmithing was an important activity in the capital's Jewish quarter, and Sagunto also hosted some highly reputed silversmiths in the 15th century (Hinojosa 1992, 101). To these, we may now add the iron and silver workers from the Jewish quarter of Molina.

To conclude, the impact of the feudal conquest on mining and metallurgy in the case of the Lordship of Molina as a frontier territory seems clear. On the one hand, it implies a continuity (and intensification) in the exploitation of the surrounding mining resources following the conquest, important for the maintenance of a society such as a feudal one in political, economic and commercial terms. On the other hand, it implies changes and continuities in the miners and specialised metal craftspeople, seeing how technological knowledge continued to fall to some of the ethnic groups who knew the trade. In short, the study of the exploitation and working of metal has made it possible to contribute to the investigation of the ecology and multiculturalism of frontiers in medieval Iberia.

### Acknowledgements

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Fig. 9.10. Two Jews in their textile and goldsmithing workshops; the latter is shaping a chalice with a hammer on an anvil. Opening miniature in Vidal Mayor, Aragón (around 1290–1310). Getty Museum Collection Ms. Ludwig XIV 6 (83.MQ.165), fol. 243v (Source: <https://www.getty.edu/art/collection/object/105WEC>)

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# Mortar composition and technology in Islamic and Christian fortifications: Case studies from Guadalajara and Andalusia

*Kevin M. J. Hayward*

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## Introduction

Crowning the spectacular limestone scenery of central and southern Spain, ruins of Islamic and Christian towers and castles create a lasting and vivid impression of medieval Iberia in conflict. Yet very little is known of the construction materials; their fabric and their ability to withstand many centuries of sometimes very hostile hot, dry (and indeed very cold) weather in these remote, upland areas, let alone occupation, fires and conflict. How does the mortar that binds these often-colossal stone structures withstand such extremes in temperature and how does *tapia* (rammed earth) feature and indeed survive in these constructions?

Fortunately, the rich underlying Mesozoic and Tertiary marine geology of Spain, associated with the deposition of the vast Tethys Sea, is blessed with a multitude of these vital ingredients, namely gypsum, lime, marine silts and sands. Gypsiferous Spain covers an area of approximately 21,700km<sup>2</sup> or 58.5% of the total landmass, making it the eighth largest gypsum producer in the world. Limestone and dolomite are a ubiquitous and accessible resource forming some of the highest and most spectacular peaks in Andalusia and Guadalajara on which these strongholds still cling.

In these historical frontier zones, comparing the mortar technologies in use during al-Andalus and the later Christianised fortifications is central to our understanding of their development and sustainability, as well as changes in the construction industry following periods of conquest, territorial annexation, migration and the gradual movement of the frontier. What are the essential ingredients that make up these different ‘recipes’? What is their geological character and source? How did they change over time? And where are these valued additives brought in from? From over a distance or acquired locally?

This chapter begins to redress the balance by introducing a set of tried and tested geological techniques that will help understand what these mortars and *tapias* are; what types

of deposits they were being extracted from and, where possible, determine their geological source. Comparison will be made between the fabric of the Islamic and Christian mortars from fortifications within two regions: eastern Guadalajara in central Spain and Andalusia in southern Spain.

Case study one explores the mortar and *tapia* used in the Islamic and Christian phases of two of the largest castles in this region, the hugely impressive fortification at Molina de Aragón (Fig. 10.1) in Guadalajara province, which forms part of the UNESCO Global Geopark, overlooking the river Gallo in the Upper Tagus, and the equally stunning castle of Atienza (Fig. 10.2), perched at nearly 4000ft (1169m) altitude and located some 55–60km north north-west of Molina. Between these two strongholds, a dozen isolated and largely forgotten ruinous towers which perch on the summits of the surrounding Guadalajara hinterland underwent the same rigorous programme of mortar sampling and analysis.

Fortifications in southern Andalusia form a second case study, where Islamic and Christian mortars are again explored at three major castles. Moclin (Fig. 10.3), and its towers, which protected the northern approach to Nasrid Granada and its fortified power centre of the Alhambra. Comparison is then made with two imposing castles: Teba (Fig. 10.4) and Cártama (Fig. 10.5) in Málaga province, both located some 100km south-west of Moclin (Fig. 10.6).

Definitions of the major types of mortar and *tapia* in this study are described in the appendix.

## Existing scientific studies

This review examines scientific mortar and *tapia* studies in Islamic and Christian castles in Spain and other medieval frontier zones of Europe. Existing historical sources of mortar are not covered here as these fall outside the remit of this stand-alone scientific approach, nor does it touch on the carbon-14 potential of mortar.





*Fig. 10.1. Molina de Aragón – general view of inner ward*

There are several scientific studies on mortar from Spain, however these have focused on the macroscopic analysis of Roman hydraulic mortars (e.g. Guerra García *et al.* 2013), 16th-century mortar in bridges from Guadalajara (Guerra García *et al.* 2018) and the use of post medieval gypsum mortar (Bel-Anzue and Elert 2021). Similarly, scientific studies of tapial or rammed earth have received scant attention apart from a very detailed study of Nasrid Alhambra's earthen walls (Lanzón *et al.* 2020) and a study of modern tapial construction and conservation (Jacquin *et al.* 2005). However, our current understanding of mortar and building material use in medieval fortifications from Spain, including their form, fabric and style, is hampered by a dearth of clear scientific regional and site-specific studies.

The successful adoption of a more considered scientific methodology for understanding mortar composition in medieval fortifications using a combined macroscopic and microscopic (thin section) analysis in eastern Europe (Hayward 2019) and Spain (Hayward 2024a, 2024b), prompted the

inclusion of this approach into this case study. In these earlier studies a detailed appreciation of the underlying and local drift and solid geology using geological memoirs, alongside online resources, was essential to our understanding of the aggregate and lime, as well as the composition of the binding matrix.

For example, hand specimen and thin section analysis of thirteen primary bedding mortars used in Teutonic Order brick castles and fortifications in Pomesania (historical Prussia, modern Poland) and stone castles in the former historical territory of Livonia (modern Estonia and Latvia) (Hayward 2019, 51–53; plate 10.9a–9f), were able to identify the geological character and source of their ingredients and show differences in fabric under the microscope by region, by building campaign and illustrated using photomicrographs. In this case Pomesanian lime sandy mortars used glacial and periglacial sand aggregate bonded by lime from chalk-clays from ice-dammed lakes at Dzierzgoń, Gyttya and marine interglacial clays, reflecting the extensive Pleistocene cover of the North Polish Plain. Lime sandy mortars





*Fig. 10.2. Atienza castle – general view*

from fortifications in Estonia and Latvia, on the other hand contained aggregate and calcined material from Holocene tufa and fossil rich Silurian and Devonian limestones, as well as gypsum.

The successful adoption of this approach in a recent pilot study of mortar and tapial composition from medieval Islamic and Christian medieval fortifications at Balaguer at the World Heritage site of Pla D'Almata as well as Noguera Valley in Catalonia (Hayward 2024a, 2024b) included being able to distinguish major differences between Islamic and Christian mortar and a plethora of different tapial construction materials. The earlier Islamic mortar was gypsum based of better quality, being harder, finer and of a lower density. It had a wider distribution, with a centralised outcrop of gypsum centred around Gerb (Plate 10.1a) supplying numerous fortifications upstream and downstream along the Noguera. By contrast the later Christian lime mortars at

these isolated fortifications were sourced to local limestone outcrops (Plate 10.1b) based on fossil content, suggesting the scale of operation in mortar production was smaller and more piecemeal.

### **Methodology**

The successful adoption of an earth-science approach in this pilot study has provided a set of results that can be compared to Islamic and Christian mortar and tapial samples from medieval fortifications in two other historical frontier regions of Spain: Guadalajara and Andalusia. With its numerous fortifications (castles, towers) it was also an ideal opportunity to put this tried and tested methodology into practice.

For the case studies presented in this chapter, a total of 101 mortar and tapial samples were taken from sites in





*Fig. 10.3. Molina de Aragón castle – general view*



*Fig. 10.4. Teba castle – general view*





Fig. 10.5. Cártama castle – general view

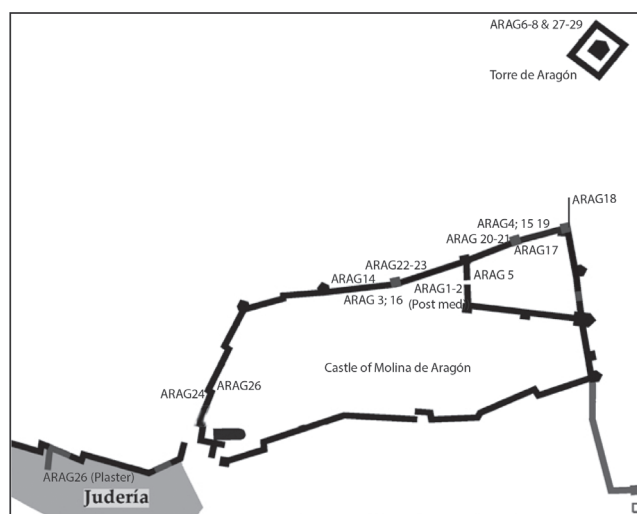


Fig. 10.6. Torre de Aragón and Molina de Aragón castle Mortar and tapial sample location

Guadalajara and Andalusia. For the region of Guadalajara located in central Iberia, targeted fieldwork conducted between 2016 and 2023 focused on the sampling of two of the very largest strongholds in this region: Molina de Aragón and Atienza. At Molina de Aragón, an early focal point for the defence of the al-Andalus against Christian kingdoms

to the north, capital of the independent Islamic polity, the *taifa* of Molina and then a centre of Christian power in the late medieval period on the frontier between Aragón and Castille (García-Contreras Ruiz *et al.* 2016), sampling was extensive. The castle at Atienza, 65km north-west of Molina de Aragón, had an equally important strategic role to play in the 11th-century frontier zone with important Islamic and two later Christian defensive building phases. Twelve surviving towers, from the hinterlands of Atienza and Molina de Aragón were also sampled, primarily to determine their composition and whether they can be assigned an earlier Islamic or later Christian phase of occupation. For Andalusia three sites were selected for mortar and tapial analysis: the castles at Moclín, Teba and Cártama, all of which underwent important Islamic (referred to here as Nasrid 1 and 2) and Christian building programmes in this volatile frontier zone.

In each region, selective sampling from these fortifications was not always straightforward as dating the different periods of Islamic and Christian occupation remained unresolved. To this end a characterisation study of the mortar used in different construction phases sought at least to establish the earliest developments in the extraction, supply and technological innovation of these raw materials, often in a frontier zone without a pre-existing tradition of working these materials.



Each of these samples was counted and weighed (Satorius AG Gottingen Electronic Scales) in-house and analysed using a hand lens (Gowland  $\times 10$ ) and binocular microscope (Leica L2). They were examined to determine the basic mortar ingredients, whilst the texture, angularity and colour of the mortar mix were assessed with the aid of a Munsell Colour Chart (Munsell Color Group 1980).

A good understanding of the local and regional geology for the Guadalajara and Andalusia regions, including some idea as to the composition of the rock inclusions, was essential and made possible following consultation of key texts (e.g. Gibbons 2011) and the local 1:50,000 geological e-maps of the Guadalajara and Andalusia region accessible online from the Instituto Geológico y Minero de España IGME.<sup>1</sup>

To understand their fabric in greater detail, 77 samples (Tables 10.1, 10.2) were prepared for thin section analysis by Hands on Thin Sections Ltd. The detailed procedural implications and sample preparation associated with the production of a mortar mounted on a glass slide can be referred to in Hayward (2009) and Pluskowski *et al.* (2016). The embedding in coloured araldite resin (CY1301) was necessary in mortar and tapial for two reasons. First, the process of embedding with the addition of a hardener (HY951) strengthened the often-friable samples. Second, the addition of a green colouring agent (BW1034) during the process highlighted the pore spaces in the sample enabling the overall porosity to be determined.

Staining is a necessary process (Adams and Mackenzie 1998) during the production of the calcined lime mortar

Table 10.1. Thin sectioned mortar and tapial samples – Guadalajara

| Castle           | Locality (altitude and GPS location where known)                                                           | Thin section | Function |
|------------------|------------------------------------------------------------------------------------------------------------|--------------|----------|
| Molina de Aragón | 1187m latitude 40; 50; 45.8907999 longitude 1; 53; 13.49250000<br>19th-century repair mortar gatehouse     | ARAG1        | Mortar   |
| Molina de Aragón | 1168m latitude 40; 50; 44.6684999 longitude 1; 53; 13.40250000<br>19th-century repair mortar gatehouse     | ARAG2        | Mortar   |
| Molina de Aragón | inner wall Tower 4                                                                                         | ARAG3        | Tapial   |
| Molina de Aragón | 1161m latitude 40; 50; 50.175400000075 longitude 1; 53; 10.56739999<br>Outer perimeter wall Towers 1 and 2 | ARAG4        | Mortar   |
| Molina de Aragón | Latitude 40; 50; 38.35140000001<br>Longitude 1; 53; 14.960600002 inner wall gatehouse                      | ARAG5        | Mortar   |
| Molina de Aragón | Outer perimeter wall inner face between Towers 4 and 5                                                     | ARAG14       | Mortar   |
| Molina de Aragón | Outer perimeter wall Towers 1 and 2                                                                        | ARAG15       | Mortar   |
| Molina de Aragón | Inner wall Tower 4                                                                                         | ARAG16       | Tapial   |
| Molina de Aragón | Inner wall inner fort Tower 2                                                                              | ARAG17       | Tapial   |
| Molina de Aragón | External causeway                                                                                          | ARAG18       | Mortar   |
| Molina de Aragón | Outer perimeter walling mortar between Towers 1 and 2                                                      | ARAG19       | Mortar   |
| Molina de Aragón | Front of Tower 2                                                                                           | ARAG20       | Tapial   |
| Molina de Aragón | Foundation stone mortar beneath ARAG20 Tower 2                                                             | ARAG21       | Mortar   |
| Molina de Aragón | Side of Tower 4                                                                                            | ARAG22       | Tapial   |
| Molina de Aragón | Foundation stone mortar beneath ARAG22 Tower 4                                                             | ARAG23       | Mortar   |
| Molina de Aragón | Outer perimeter walling near Jewish quarter                                                                | ARAG24       | Mortar   |
| Molina de Aragón | Internal wall Jewish quarter                                                                               | ARAG25       | Plaster  |
| Molina de Aragón | Outer perimeter wall internal face herringbone walling                                                     | ARAG26       | Mortar   |
| Torre de Aragón  | 1228m latitude 40; 50; 51.864600000 longitude 1; 53; 8.99660000003<br>Earliest tower wall packing          | ARAG6        | Tapial   |
| Torre de Aragón  | 1229m latitude 40; 50; 51.9881999999 longitude 1; 53; 8.9623000000                                         | ARAG7        | Tapial   |
| Torre de Aragón  | Near ARAG7 earliest tower wall packing mortar                                                              | ARAG8        | Mortar   |
| Torre de Aragón  | Small section of surviving walling                                                                         | ARAG27       | Mortar   |
| Torre de Aragón  | Upper tower                                                                                                | ARAG28       | Tapial   |
| Torre de Aragón  | Upper tower pink mortar                                                                                    | ARAG29       | Mortar   |
| Atienza          | Central bastion upper ward first floor internal                                                            | ARAG30       | Mortar   |

(Continued)

Table 10.1. (Continued)

| <i>Castle</i>                | <i>Locality (altitude and GPS location where known)</i>           | <i>Thin section</i> | <i>Function</i> |
|------------------------------|-------------------------------------------------------------------|---------------------|-----------------|
| Atienza                      | Central bastion upper ward external wall ground level             | ARAG31              | Mortar          |
| Atienza                      | Enclosure wall upper ward natural cliff edge near central bastion | ARAG32              | Mortar          |
| Atienza                      | Cistern 1 upper ward                                              | ARAG33              | Mortar          |
| Atienza                      | Outline of early bastion upper ward above herringbone walling     | ARAG33              | Mortar          |
| Atienza                      | Upper part of ashlar wall upper enclosure                         | ARAG35              | Mortar          |
| Atienza                      | Lower part of ashlar wall large foundation upper enclosure        | ARAG36              | Mortar          |
| Atienza                      | Christian Phase 1 entrance gate                                   | ARAG37              | Mortar          |
| Atienza                      | Christian Phase 1 walled section                                  | ARAG38              | Mortar          |
| Atienza                      | Jewish quarter wall                                               | ARAG39              | Mortar          |
| Atienza                      | Christian Phase 2 bastion                                         | ARAG40              | Mortar          |
| Riba de Saelices             | Watchtower primary material                                       | ARAG9               | Mortar          |
| Abañete de Tajuña            | Watchtower primary material                                       | ARAG10              | Mortar          |
| Abalate de Tajuña            | Watchtower repair material                                        | ARAG11              | Mortar          |
| Torre Atalaya de Los Casares | Watchtower primary mortar                                         | ARAG12              | Mortar          |
| Torre Atalaya de Los Casares | Watchtower primary mortar                                         | ARAG41              | Mortar          |
| Torre Atalaya de Los Casares | Watchtower internal mortar first floor                            | ARAG42              | Mortar          |
| Torre Atalaya de Los Casares | Watchtower internal mortar ground floor                           | ARAG43              | Mortar          |
| Cubillejo De La Sierra       | Watchtower part of Farm House                                     | ARAG13              | Mortar          |
| Torre Chilluente             | Watchtower primary mortar                                         | ARAG44              | Mortar          |
| Torre Mojonazo               | Watchtower primary mortar                                         | ARAG45              | Mortar          |
| Torre de Barbatona           | Watchtower primary mortar lower level of later house              | ARAG46              | Mortar          |
| Torre de Bujarrabal          | Watchtower primary mortar                                         | ARAG47              | Mortar          |
| Riba di Santiusti Castle     | Castle lower wall primary tapial                                  | ARAG48              | Tapial          |
| Torre del Congosto           | Watchtower primary mortar                                         | ARAG49              | Mortar          |
| Torre de la Membrillera      | Watchtower primary mortar                                         | ARAG50              | Mortar          |

thin section. It picks out the variability in colour between ferroan and non-ferroan calcite as well as dolomite, with the addition of Alizarin Red C and Potassium Hexacyanoferrate. Gypsum, a vital ingredient in many of these mortars, can also be identified, as it does not stain.

This high-resolution petrographic approach enabled each 30-micron slice of mortar and tapial to be viewed under the polarising microscope at magnifications greater than  $\times 400$  (Leica DMLP). Thin sections can help distinguish between types of calcite grains, minerals, cements, microfossils, gypsum vegetative matter, tile and rock inclusions. Next, a series of photomicrographs of the mortars and tapial (Leica DFC 320 digital camera) were produced to illustrate similarities and differences of the materials being

used. Photomicrographs relating to each of these mortars are illustrated below (see plates).

## Geological background to material availability

### Guadalajara

Forming part of the Castilian branch of the Iberian range (Gibbons 2011, 192, fig. 1.4) this tract of Guadalajara, stretching from Molina de Aragón to Atienza in central Iberia is characterised by a series of graben-faulted basins each with their own suite of terrestrial, marine and brackish sediment material choices. The Molina de Aragón Basin is mainly marine and consists of Upper Permian to Lower Jurassic shales, whilst the Noviales-Atienza basin to the

Table 10.2. Thin sectioned mortar and tapial samples – Andalusia

| <i>Castle</i>                     | <i>Locality</i>                                     | <i>Thin section</i> | <i>Function</i> |
|-----------------------------------|-----------------------------------------------------|---------------------|-----------------|
| Moclín                            | Tower M Christian facing mortar                     | GRAN1               | Mortar          |
| Moclín                            | Tower M Christian bedding mortar                    | GRAN2               | Mortar          |
| Moclín                            | Tower J/K Nasrid 2 bedding mortar                   | GRAN3               | Mortar          |
| Moclín                            | Tower C Nasrid I tapial                             | GRAN4               | Tapial          |
| Moclín                            | Tower B Nasrid 1 tapial                             | GRAN5               | Tapial          |
| Moclín                            | S6 Tower E Nasrid 2 tapial                          | GRAN6               | Tapial          |
| Moclín                            | Outer enclosure wall Nasrid 2 facing mortar         | GRAN7               | Mortar          |
| Moclín                            | Outer enclosure wall Nasrid 2 bedding mortar        | GRAN8               | Mortar          |
| Torre de la Porqueriza o de Tozar | Watchtower Nasrid bedding mortar                    | GRAN9               | Mortar          |
| Torre de la Porqueriza o de Tozar | Watchtower Nasrid facing mortar                     | GRAN10              | Mortar          |
| Torre de la Dehesilia             | Watchtower Christian bedding mortar                 | GRAN11              | Mortar          |
| Torre de la Moraleja              | Watchtower Christian bedding mortar                 | GRAN12              | Mortar          |
| Agicampe Tower                    | Watchtower bedding mortar                           | GRAN13              | Mortar          |
| Teba                              | Outer enclosure wall Christian facing mortar        | GRAN14              | Mortar          |
| Teba                              | Outer enclosure wall Christian bedding mortar       | GRAN15              | Mortar          |
| Teba                              | Tower D Nasrid 2 bedding mortar                     | GRAN16              | Mortar          |
| Teba                              | Tower D Nasrid 2 bedding mortar                     | GRAN17              | Mortar          |
| Teba                              | Outer enclosure wall Nasrid 2 facing mortar         | GRAN18              | Mortar          |
| Teba                              | Outer enclosure wall Nasrid 2 bedding mortar        | GRAN19              | Mortar          |
| Teba                              | Christian fortress facing mortar                    | GRAN20              | Mortar          |
| Teba                              | Christian fortress bedding mortar                   | No section          | Mortar          |
| Teba                              | Outer enclosure wall Nasrid tapial with formwork    | GRAN22              | Tapial          |
| Teba                              | Outer enclosure wall Nasrid tapial basal foundation | GRAN23              | Tapial          |
| Cártama                           | Upper tower Nasrid facing mortar                    | GRAN24              | Mortar          |
| Cártama                           | Upper tower Nasrid bedding mortar                   | GRAN25              | Mortar          |
| Cártama                           | Outer enclosure wall Nasri 2 bedding mortar         | GRAN26              | Mortar          |
| Cártama                           | Outer enclosure wall Nasri 2 facing mortar          | GRAN27              | Plaster         |

north is more volcanic. There is also the Palmaces basin (very coarse-grained sandstone) and the Valdestos Basin (not included in this study) which are different again. Therefore, the building material choices for castles located within each of these defined basinal zones (including resources suitable for mortar; lime, gypsum and aggregate) may in each case be influenced by the local geology.

Forming just one small part of the spectacular geology and topography of the UNESCO Molina-Alto Tajo global Geopark, including the La Hoz Canyon fortifications in the immediate area of Molina de Aragón, the region has an underlying geology dominated by a highly variable 900m-thick Upper Permian to Lower Jurassic succession. Forming part of the tectonic or graben-faulted Molina de Aragón Basin, these sediments crop out along the valley sides and tops of the River Gallo. They consist of Upper Permian marls and black shales (Autunian) through to the extremely hard Lower Jurassic Imon Dolomites

(Hettangian) (Gibbons 2011, 192, fig. 1.4) on which the fortified complex at Molina de Aragón is perched, and are the essential ingredient for the walling rubble in the castle. Within this sequence there are also thick sediments of local red-brown Triassic (Bunter) sandstone which formed the decorative ashlar façade of the inner gatehouse at Molina de Aragón and gypsum from the Upper Triassic (Keuper) evaporitic succession (Gibbons 2011, 192, fig. 1.4). suitable for gypsum production of plaster and mortar. In addition, geologically recent Pliocene lacustrine limestones and marl, Pleistocene talus or hillside scree deposits could provide suitable sources of rammed earth as well as the Holocene alluvial deposits. Potential local sources of lime for the mortar could come from the Middle Triassic to Lower Jurassic dolomites, these Pliocene lacustrine limestones or scree talus from the Dolomitic limestones and limestones. All these materials lie within close range to one another, and it would have made economic and practical sense to



use these on-site materials, rather than acquire them by boat from outcrops further upstream.

The underlying geology and spectacular topography of the surrounding hinterland contains broadly the same sequence of rocks. There are, however, much larger outcrops of Upper Triassic (Keuper) gypsum (Gibbons 2011, 192, fig. 1.4) which crop out immediately beneath Torre Atalaya de Los Casares and provided an important source of gypsum in the Islamic tower, but possibly in Al Andalus in Guadalajara too.

At Atienza, the underlying geology of the graben-faulted Noviales-Atienza basin (Gibbons 2011, 192, fig. 1.4) is slightly older and has a much thicker sequence of Permian (Autunian) to Triassic (Bunter, Keuper and Muschelkalk) sediments compared to the Molina de Aragón Basin. The oldest hard volcanic units (Andesitic and pyroclastic flow deposits) are overlain by 1200m of a much coarser, thicker sequence of terrestrial alluvial fan-fluvial deposits of red mudstone, sandstones and conglomerates, all suitable aggregate in mortar and a vital ingredient in tapial.

Suitable sources of lime and gypsum for mortar production, however, lie in the overlying Bunter, Muschelkalk, and Keuper beds of the succeeding Triassic and include evaporite deposits, dolomites, marls and mudstone (Gibbons 2011, 192, fig. 1.4). Extensive gypsum deposits, for example, were quarried from the immediate surroundings of Atienza castle whilst significant salt or brine field production is a feature of the agricultural landscape on flat ground between Atienza and Sigüenza.

### **Andalusia**

The underlying geology of this large study area, c. 100km long by c. 50km wide, is both diverse and complex. Forming an extensive tract of Andalusia, between Granada and Malaga, it extends in a NW–SE direction to include the fortification of Moclin, the towers of Torre de la Dehesilia and Torre de la Moraleja, westwards towards Torre Agicampe, Teba and finally Cártama.

The territory is dominated by a variety of basin-faulted Mesozoic (Triassic, Jurassic, Cretaceous) sandstones, limestones and marls, that because of intensive Tertiary tectonic activity have been, thrust faulted over younger Tertiary (Miocene-Neogene) sediments consisting of marls, conglomerates and some limestones. In this area of spectacular upland and basin topography formed by the convergence of the African Plate with the European Plate (Alpine and Pyrenean orogeny) there is considerable lateral variation in the type of rock (and potentially mortar composition) often over very small geographical distances. This necessitates a more detailed appreciation of the local geology for each major fortification (Gibbons 2011, 1).

Regionally, sources of lime in mortar are widespread, given the importance of carbonate deposits, but they are rather depleted in evaporites, meaning that gypsum as an

active ingredient in mortar is less likely to be represented. Sources of material suitable for rammed earth or Tapial have likely come from Tertiary and Quaternary mud, lime mud and silt scree deposits.

Moclin castle and the associated Andalusí tower of Torre de la Porqueriza o de Tozer lie in a heavily faulted upland area dominated hard Jurassic dolomitic limestones and oolitic limestones together with softer Lower Cretaceous marly limestones and white marls, all of which provide suitable sources of lime in mortar. Olistostrome deposits, which are essentially massive sedimentary slumped units of mudstone, also feature. Holocene colluvial units consisting of angular blocks of shale and mud secondarily reworked out of the Olistostrome deposit also provide a suitable source of tapial.

Teba (Estrella) castle by contrast, at 640m.a.s.l., is steeply perched upon old hard Middle (Dogger) and Upper (Malm) Jurassic limestones above the Guadalteba Valley and Turon river. The variety of hard grey, yellow and red oolitic, brecciated and stromatolitic limestones all provide suitable source of lime as do the up-thrusted softer Upper Cretaceous (Cenomanian) chalky-marl limestones and Jurassic bioclastic limestones. The Cenomanian sequence also contains gypsum suitable for plaster and mortar production.

Finally, the fortification at Cártama, just 1–2km south of the Guadalhorce river, caps much older and harder Triassic metamorphic rocks including quartzites, amphibolites and gneisses and white marble. These overlie younger Palaeogene sands, clays and marls, Lower Pliocene clays and fossiliferous marls and Upper Pliocene scree deposits with limestone. It follows that there are not only sources of lime available nearby but also good hard aggregates from the older Triassic peak.

### **Case Study 1: Guadalajara mortar and tapial**

The results from the Guadalajara case study are based on findings from 72 selected samples (4098.44g) of mortar and tapial taken from two major castles (Molina de Aragón; Atienza) and eleven towers dotted across the Guadalajara landscape, of which 50 thin sections (ARAG1–ARAG50) were produced (Table 10.1). From the ensuing hand specimen and thin section descriptions it has been possible to subdivide up this large dataset into distinctive groupings based on the type of ingredients used in the mortar and tapial. Furthermore, these different mortar and tapial recipes and technologies relate to construction phases that repeat across the Guadalajara landscape.

#### ***Torre de Aragón and the castle of Molina de Aragón***

An intensive programme of mortar and tapial sampling from the outer defensive circuit wall, its fourteen towers and gates, including an enclosed ward around the original citadel at Molina de Aragón, resulted in the production of

eighteen thin sections (ARAG1–5; ARAG14–26) (Table 10.1). The mortar from the adjacent Torre de Aragón was sampled in a similar fashion (ARAG6–8; ARAG27–29).

The study sought to understand whether certain mortar and tapial recipes were diagnostic of a particular phase associated with the structures' very complex and lengthy construction history. Given that existing studies (García-Contreras Ruiz 2015) had already concluded that construction during the Andalusi period in Molina de Aragón and adjacent tower sites was mainly conducted at a local level, could the geological fabric of the different Islamic tapials and mortars alone be used to verify whether this was the case or not? Furthermore, were ingredients of later Christian mortars used to bond substantial upper stone masonry levels similarly obtained from local lime, sand and rock materials?

#### *Pink gypsum mortar and tapial – Torre de Aragón*

All six gypsum-based mortar and tapial samples (ARAG6–8; ARAG27–29) from Molina de Aragón were identified in the Andalusi-phase tower of Torre de Aragón. Positioned

some 70m above the later castle at 1228m.a.s.l, the original external tower probably dates from the 8th to 10th century, including sections of tapial walling (Fig. 10.7) and mortar used to bond the large foundation blocks.

The tapial walling is a distinctive low-density light red-dish brown 2.5YR 7/ gypsum rich calicostrade tapial, with red 5R 5/8 and light grey 10YR 7/1 acicular gypsum with black charcoal 10YR 2/1. The foundation mortar (ARAG29) has broadly the same composition. The quartz deficient thin section has very little lime mud and hexagonal shaped euhedral gypsum crystals (Plate 10.1c) (Adams *et al.* 1984, figs 195–196). There was an exceptionally good match with gypsum mortar recorded from the 9th- to 10th-century Islamic Torre Atalaya de Los Casares located 30km north-west (Figs 10.8, 10.9) including well-formed hexagonal gypsum crystals (Plate 10.1d). Also, the site of a large gypsum quarry dating to the Andalusi period, the powdered plaster of Paris raw materials from here could easily have been transported overland to Torre de Aragón.



Fig. 10.7. Relict gypsum tapial Torre de Aragón 8th to 10th century



Fig. 10.8. Very similar salmon pink gypsum mortar in 8th to 10th century, Torre Atalaya de Los Casares





Fig. 10.9. Torre Atalaya de Los Casares

#### *Islamic chalky gypsum lime mortar – Molina de Aragón*

This hard, fine pink-white 5YR 8/2 chalky foundation mortar bonds specific areas of lower stonewalling in the castle. Included is its use in early herringbone walling (ARAG26), located on the inward-facing courses of the outer perimeter wall towards the Molina gate entrance, stone foundations for Tapial Towers 2 (ARAG21) and 4 (ARAG23) and seen in the lower courses of the citadel gatehouse between Towers 3 and 8.

In thin section (ARAG26) the very fine calcite ground-mass gives the mortar its distinctive powdery chalky colour, which is enhanced by the occasional fragment of tapial (Plate 10.1e), charcoal and crushed gypsum.

#### *Islamic pebbly calicostrade tapial – Molina de Aragón*

Above the chalky lime bonded foundation blocks of Towers 2 and 4 a calcium rich pebbly tapia coats their entire external and internal façade (Plate 10.2a). Present in four samples ARAG3, ARAG16, ARG20 and ARAG22, this rammed earth consists of a very hard pinkish white 5YR 8/2 very

coarse-grained gravel calicostrade tapial (Plate 10.2b). It contains many different gravel fragments up to 40mm long, including brown 7.5YR 5/2 sandstone, and white angular 10YR 8/1 gypsum. Formwork is present in Tower 2 (Plate 10.2a).

At a greater magnification (ARAG20) very large silt sized cellular quartz aggregates up to 8mm across with fine irregular flecks of organic matter dominate (Plate 10.2a). Set in a fine calcic matrix, this lime additive has been used to increase stability and protect the external face.

#### *Slaked lime sandy lime mortar with tapial – Molina de Aragón*

The entire circuit of the outer defensive circuit wall consists of this durable yellow-pink 7.5YR 8/3 lime pebble-gravel mortar with white 10YR 8/1 calcined lime up to 15mm across and dolomite, limestone and calcareous sandstone inclusions from the underlying bedrock. Samples from the wall (ARAG4, 14, 15, 19), two from the inner ward wall of the gatehouse (ARAG5, 17) the causeway emanating out from T1 towards Torre De Aragón show this to be one very large later building programme. Sandy lime mortars feature in many Christian defensive builds in Guadalajara, Andalusia and Balaguer (Hayward 2024a, 2024b). The slaked lime seen in thin section (Plate 10.3a) is a by-product of the heating process associated with the production of lime mortar.

A section of the external perimeter wall towards the Jewish quarter (Plate 10.2c) also had large lumps of dark grey nodular slag up to 5cm across. Essentially the same recipe as the rest of the wall, the addition of slag seen in thin section as a large nodular lump (Plate 10.3b), a by-product of metalworking may relate to the one of the crafts that was taking place in the nearby Jewish quarter (see Hernández-Casas *et al.*, Chapter 9).

#### *Atienza*

The castle at Atienza with its several defensive circuit walls, representing at least one Islamic and two Christian building phases, underwent a rigorous programme of mortar sampling (17), 11 of which (ARAG30–40) underwent subsequent thin section analysis examination (Table 10.1, Plate 10.6). Direct comparison was therefore possible with the Torre de Aragón and castle at Molina de Aragón which also experienced different Islamic and Christian phases of construction.

#### *Pink gypsum mortar and tapial gypsum mortar – Islamic*

The outline of a single square Islamic tower located at the very top of Atienza fortifications immediately above a small area of herringbone walling (Fig. 10.10) provided the only evidence for Islamic mortar. The sample (ARAG34) had all the hallmarks of a pinkish-white





Fig. 10.10. Outline of Islamic tower with herringbone walling, Atienza

2.5YR 8/2 fine low-density gypsum mortar having light red 2.5YR 6/6 iron stained and white translucent 10YR 8/1 gypsum 2–3mm across. The section shows it to be quartz deficient with the same hexagonal crystals of gypsum (Plate 10.3c) seen in pink Islamic mortar and tapial at the Torre de Aragón (Plate 10.1c). Outcrops of gypsum are locally accessible as old workings in Upper Triassic Keuper Beds and visible from the top of the fortifications.

#### *Gritty sandy lime mortar – Christian 1*

A major phase of Christian I building and rebuilding including the gateway entrance (ARAG37), adjacent extant lower circuit walling (Fig. 10.11) (ARAG38), which encircles the defensive outcrop at Atienza is marked using a soft very pale ‘dirty’ grey-brown 2.5Y 8/2 gritty mortar. Weathering easily, it contains rare translucent 10YR 8.4 gypsum, and large pebbles of grey 10YR 6/1 and pale brown limestone

and is associated with the construction of small ashlar blocks in this defensive wall. Its use, however, extends to bonding other petit appareil blocks of the above lying upper enclosure (ARAG35) and even monumental blocks beneath (ARAG36). The detail of this fabric shows it to be made of exceptionally large (2mm), angular, well-packed grains of quartz but a weak lime matrix, making it prone to weathering (Plate 10.3d).

#### *Sandy lime mortar with fossil mudstone – Christian 2*

The mortar types from later Christian 2 defences at Atienza including a circuitous line of bastions (Fig. 10.12) around the medieval town are easily distinguishable from the poorer quality Christian 1 recipes. Samples taken from a bastion (ARAG40), and walling from the nearby Jewish quarter (ARAG38, 39), show it to be a soft, low-density pure chalky white 10YR 8/1 with fine mortar, light





Fig. 10.11. Christian 1 outer defensive circuit wall and small ashlar blocks

grey 10YR 7/1 translucent gypsum and black 10YR 2/1 charcoal. The use of this mortar, however, may extend to a major rebuilding programme within the uppermost ward, including the weathered defensive circuit wall (ARAG32) and the inner and outer walls of the central tower (ARAG30, 31), where somewhat comparable recipes were identified. But a further comparative analysis including a more concerted programme of intensive mortar sampling is required to see if this can be determined. In thin section (ARAG40) the quartz inclusions are less densely packed and appear to ‘float’ in a thicker chalky lime mud groundmass. A fine fossiliferous mudstone probably from the local lime rich Upper Triassic Bunter Muschelkalk is present (Plate 10.3e).

Broadly having the same recipe and coating two tile constructed cisterns in the upper ward was a very fine, low-density white 10YR 8/1 chalky white gypsum plaster. The presence of gypsum is widespread with large dark grey laths (Plate 10.3f) especially apparent.

### ***Towers in the Guadalajara case study area***

The chronological changes seen in medieval mortar technology at the castles of Molina de Aragón and Atienza form the basis for a technological review of the 11 towers dotted across the eastern Guadalajara landscape. These are Torre Atalaya de Los Casares, Riba de Saelices, Cubillejo de la Sierra, Torre Albalate de Tajuña, Castillo de Riba de Santiuste, Torre Chilluente, Torre Mojonazo, Torre de Barbatona, Torre de Bujarrabal, Torre del Congosto and Torre De la Membrillera.<sup>2</sup>

### ***Gypsum mortar – Islamic towers***

Islamic gypsum mortars are widespread and come in two types, each bonding herringbone walling. First there is a durable pink recipe used as bedding mortar in towers from the Torre Atalaya de Los Casares (ARAG12, 41–43), 30km north of Molina de Aragón; the isolated Torre Mojonazo (ARAG45) 10km south-east of Sigüenza; the surviving base of a tower converted into a house from nearby Torre





*Fig. 10.12. Christian 2 bastion surrounding medieval town*

de Barbatona (ARAG46) and a tapial fragment with these features from Castillo de Riba Santiuste (ARAG48). In detail it is a low-density hard light reddish brown (salmon pink) 2.5YR 6/4 to very pale brown 10YR 8/4 gravelly gypsum recipe with white angular 10YR 8/1 gypsum inclusions up to 15mm across. Like the examples from the early rectangular-shaped Torre de Aragón (ARAG6–8, ARAG27–29) (Plate 10.1c) and the relict Muslim tower at Atienza (ARAG34) (Plate 10.3c) they are quartz deficient and contained well-defined hexagonal crystals of gypsum in thin section.

Softer and more powdery, a second type of gypsum mortar is found in towers where the foundation stones are bonded purely in a chalky white 5YR 8/1 low-density crushed gypsum recipe, seen both in hand specimen and thin section. Identified from the Atienza region in the Torre de Bujarrabal (ARAG47), 15km north-east of Sigüenza and two towers 20km south of Atienza, the Torre de Membrillera and Torre del Congosto, these are

supplemented by examples from Molina County at the isolated Torre Chilluente (ARAG44) and at Cubillejo de la Sierra (ARAG13). They all have a similar colour and composition to the mortar from the earliest construction phases at the castle of Molina de Aragón including herringbone walling (ARAG26) (Plate 10.1e), and the stone foundation bases of two tapial towers (ARAG21; ARAG23).

#### *Sandy lime mortar – Christian towers*

Very similar lime sandy mortars to those used in the later Christian builds of Molina and Atienza are found in a selection of later strongholds from Molina County at Torre de Riba Saelices (ARAG9), and the Torre Abalate de Tajuña (ARAG10, 11). The concordance in fabric is remarkable, all show the characteristic large angular ‘floating quartz’ set in a fine lime matrix together with lumps of calcined limestone, a feature typical of most lime-based mortars at Molina and Atienza (Plate 10.3a, e).



## Case Study 2: Andalusia mortar and tapial

From this second case study, 29 samples of 156 fragments (1977.9g) of mortar and tapial were selected from three Islamic and Christian castles (Moclín, Teba and Cártama) in the Andalusia region supplemented with four towers (Torre de la Porqueriza o de Tozar, Torre de la Dehesilia, Torre de la Moraleja, Torre Agicampe). Hand specimen analysis of these coupled with a petrographic investigation of a selected 27 slides (GRAN1–27) (Table 10.2) provide a comprehensive and representative second dataset with which to compare the Guadalajara fortification database with. Once again it has been possible to relate different mortar and tapial recipes to Islamic (Nasrid 1 and Nasrid 2) and Christian construction phases.

### Moclín Castle

The three different types of tapial (GRAN4–6) and two types of mortar (GRAN1–3, 7–8) distinguished from eight thin sectioned samples (GRAN1–8) at Moclín castle very much reflects the complex building sequence with at least

two Islamic phases (Nasrid 1 and 2) and one Christian phase (Fig. 10.13).

#### *Fine lime tapial Islamic – Nasrid 1*

A type of early (Nasrid 1) rammed earth (tapial) from Moclín, this disaggregated light grey 7.5YR 7/2 to very pale brown 10YR 7/3 very fine lime tapial (GRAN5) is used only to bond the large ashlar blocks of stone that form the base of Tower B. It contains large black mudstone inclusions from the local Oligocene slump or Olistostrome deposits. At a higher resolution, small 0.5mm pockets of fine calcite silt tapial are visible set in a fine lime matrix (Plate 10.4a) with the occasional mudstone.

#### *Lime gravel tapial – mudstone Islamic – Nasrid 1*

This very different type of early (Nasrid 1) rammed earth from much of the structure of Tower C (GRAN4) was a durable high-quality pale yellow-brown 2.5Y 8/2 to 2.5Y 8/3 lime tapial with numerous gravel-sized black 7.5YR 7/1 mudstone rock inclusions and dolomite up to 70mm across. Formwork is present in Tower C (Fig. 10.14), showing the

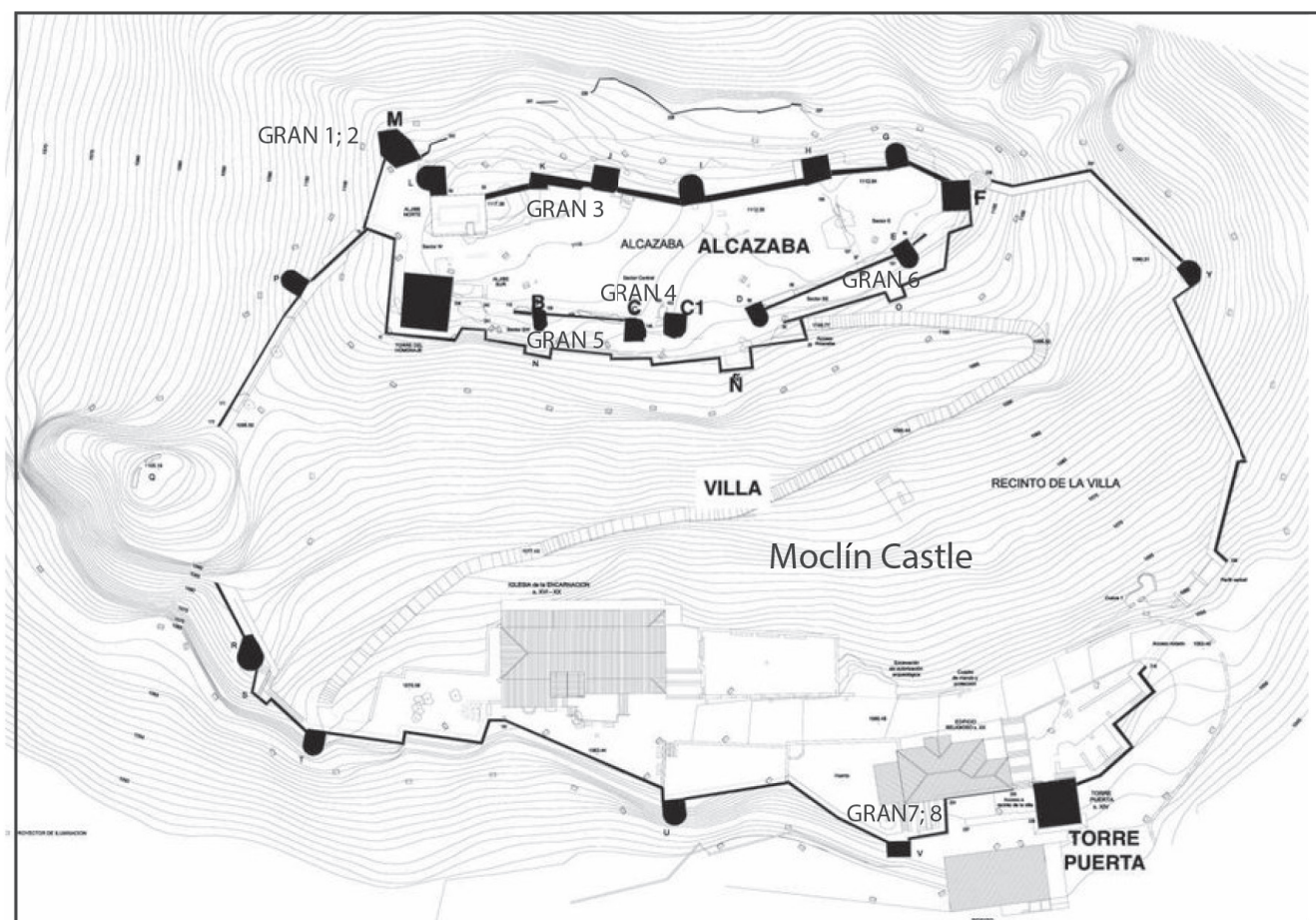


Fig. 10.13. Moclín castle – mortar and tapial sample location



compressed rectangular blocks of rammed earth each up to 10in (c. 25cm) deep. Containing large white calcareous agglomerates of lime (Plate 10.4b) set in a dark grey matrix in thin section, the presence of these mudstone Olistostrome inclusions from the local Oligocene scree are a feature of these Nasrid 1 tapials.

*Lime gravel tapial with charcoal*  
*Islamic – Nasrid 2*

Forming part of the Nasrid 2 Tower E and much of the inner enclosure wall (Fig. 10.15), this third tapial type from Moclín is a dark brownish yellow 10YR 6/6 lime gravel tapial (GRAN6) containing many different crushed up rock fragments including quartzite and dolomite but not dark grey mudstone. Lime sand agglomerates, rock inclusions, black charcoal and Jurassic micrite bedrock in thin section suggest a lime sand from a different local source (Plate 10.4c). Collectively these softer inclusions, in particular the charcoal, produce a less intact tapial compared with the purer Nasrid 1 lime sand tapial from Tower C.

*Pebbly hard dolomitic caniolas mortar Islamic – Nasrid 2*

Forming much of the Nasrid 2 walling including the surviving core wall (GRAN3) between Tower J/K and most of the outer enclosure wall including bedding and facing mortar samples by the chapel (GRAN7, 8) this extremely hard pale limonitic brown 10YR 8/3 to 10YR 7/4 caniolas gravel bedding and facing mortar has a karstic weathered nodular appearance. Hard fine calcite holds together large limestone rock fragments up to 2mm across. Thin section analysis of the three mortars (GRAN3, GRAN7–8) reaffirms the textural similarity seen in the hand specimen. With a near absence of quartz, a feature seen time and time again in Islamic mortars, it shows part of a large, dolomitised rhomb (GRAN3), a particularly hard local carbonate rock and Jurassic fossil limestone clasts, ooids and grapestones (Plate 10.4e) set in a homogeneous cream-yellow calcite, making it an exceptionally durable mortar. A similar recipe is noted from the nearby Islamic tower of Torre de la Porqueriza o de Tózar (GRAN9, 10).



Fig. 10.14. Nasrid 1 compressed calcite, rich hard tapial formwork with dark grey mudstone base of Tower C, Moclín





Fig. 10.15. Nasrid 2 perimeter wall tapial, Moclin

#### *Gritty lime mortar – Christian*

Sampled from Christian bedding and facing mortar repairs (GRAN1, 2) on Tower M, this very hard durable gritty gravelly caniolas mortar with an irregular exterior has a distinctive deep brownish-yellow 10YR 6/6 hue. Many rock types including pale grey 7.5YR 7/1 dolomite and red 10R 6/6 marl are present with the occasional black 7.5YR 2.5/1 charcoal rod. In thin section there are numerous floating quartz fragments in a fine lime matrix (Plate 10.4f) a feature of Christian medieval mortars not only in Andalusia, but also Guadalajara and Balaguer, together with large bioclasts from the underlying Jurassic. Similar mortar recipes are noted in Christian towers at Torre de la Dehesilla and Torre de la Moraleja, 10–12km north-west of Moclin (GRAN11, 12).

#### *Teba castle*

The targeted mortar and tapial sampling strategy undertaken at Teba was necessary given its complex building sequence with at least two Islamic phases (Nasrid I and II) and one

Christian phase. Two tapial types (GRAN22, GRAN23) and two mortar recipes (GRAN14–21) have been distinguished in nine samples (GRAN14–23) (Fig. 10.16).

#### *Granular quartz tapial Islamic – Nasrid 1*

Identified from the outer enclosure wall as a possible Nasrid 1 tapial, bonding ashlar blocks beneath Nasrid 2 tapial (Fig. 10.17) this soft pale limonitic brown 10YR 8/3 to 10YR 7/4 granular sandy recipe with distinctive layered rods of vegetative matter (GRAN23) also contains white marl inclusions and black 7.5YR 2.5/1 charcoal. In thin section (GRAN23) (Plate 10.5a) this poorly consolidated rammed earth has numerous cracks with local Jurassic limestone inclusions.

#### *Lime mud tapial with tile Islamic – Nasrid 2*

A much finer tapial type from a section of collapsed tapial (GRAN22) wedged between later Christian mortars and above the foundation stone Nasrid 1 Tapial from the outer enclosure wall is best described as a soft dark grey brown



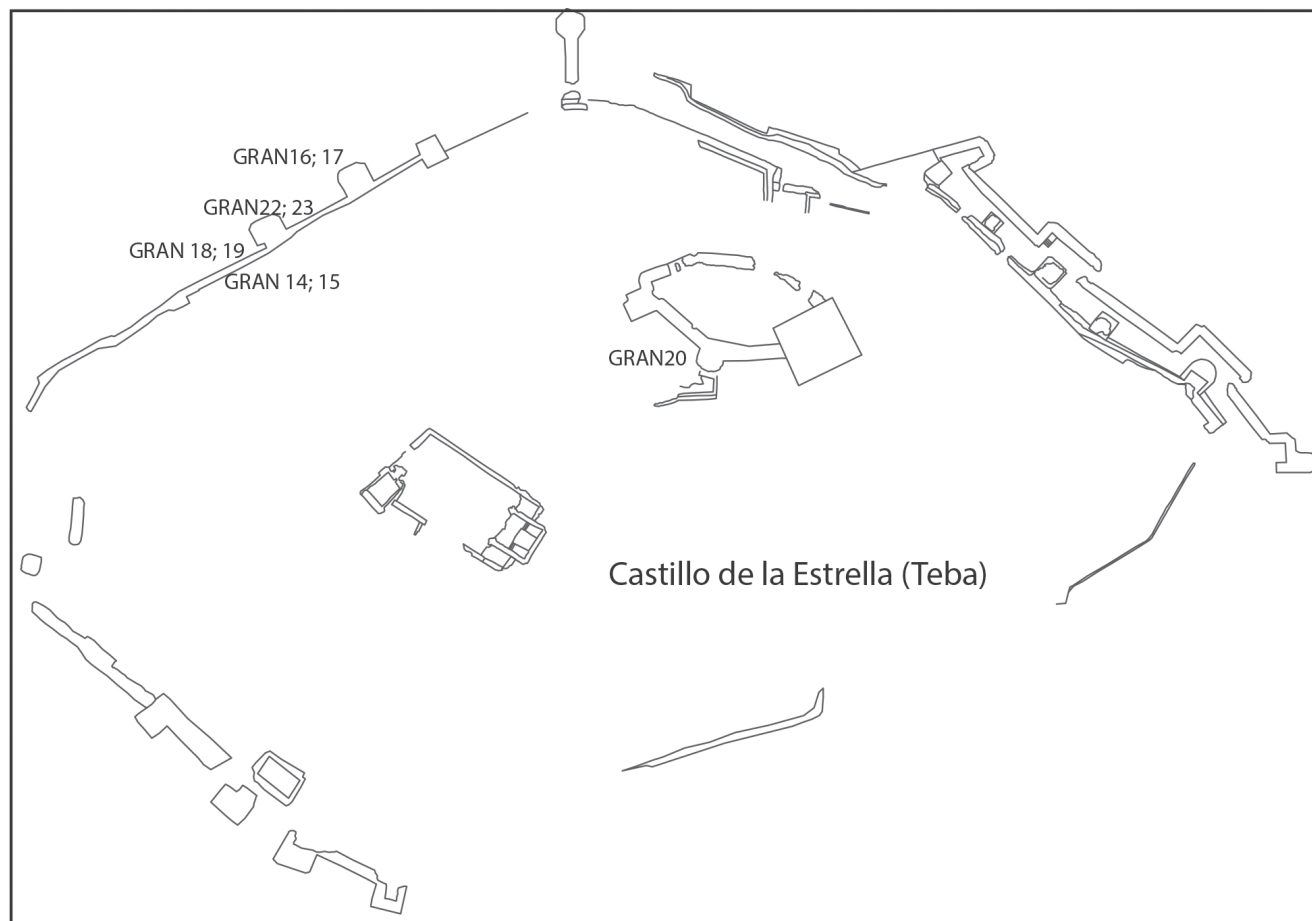


Fig. 10.16. Teba castle – mortar and tapial sample location

2.5Y 5/2 earthy recipe with pale yellow hard marl 5YR 8/2 and white marl and flecks of red tile. In greater detail (GRAN22) these features become clearer, with tile bedded inclusions set in a granular lime mud matrix and charcoal and layering of fine and coarse layers (Plate 10.5b) representing the boundary of the tapial formwork.

*Soft white chalky lime mortar with tile  
Islamic – Nasrid 2*

Identified in the bedding mortars from Tower D (GRAN16, 17) and bedding and facing mortars from adjacent sections from the outer enclosure wall (GRAN18, 19), these can be grouped collectively as moderately soft white 7.5YR 8/1 lime chalky mortars containing tiny flecks of red 10R 6/6 ceramic building material. Sections of wall that have suffered extensive weathering reveal larger tile fragments. The ceramic building material fragments in thin section (GRAN16–19) are shown by small clusters of reddened embedded white quartz embedded in fine lime mud (Plate 10.5c) where local Jurassic fossil inclusions are present and an absence of quartz which is

typical of Nasrid 2 Islamic mortars. The fine lime chalky mud seen in the matrix of these mortars, which weathers away in these walls, derives from the nearby soft Upper Cretaceous (Cenomanian) (chalk like) marly limestones rather than the harder Jurassic limestone on which the castle stands.

*Shell rich lime mortar – Christian*

The Christian building programme at Teba consists of petit appareil blocks both in the central fortress and the outer enclosure wall, which are bonded using the same shell-rich lime sandy recipe in both the bedding and facing mortars (GRAN14–15, 20–21). Soft pale limonitic brown 10YR 8/3 to 10YR 7/4 in colour with 6–8mm calcined white 7.5YR 8/1 lime they contain rare charcoal and distinctive complete small (15mm) modern high spired gastropod shells an additional important source of lime. In detail, the sizeable ‘floating quartz’ in a fine lime matrix is a facet typical of Christian medieval mortars with high spired gastropods visible (GRAN15) (Plate 10.5d). The fossil rich calcined lime in these Christian mortars comes from the underlying



Fig. 10.17. Nasrid 2 tapial over lying Nasrid I foundation blocks and lighter tapial Teba

Jurassic limestone, an entirely separate source of lime to the chalk marls of the Nasrid 2 mortars.

### ***Cártama castle***

Four mortar samples (GRAN24–27) were taken from two areas of Castillo de Cártama, the Islamic fortress at the top of the Cerro de la Ermita and the outer enclosure wall (Fig. 10.18).

### ***Sandy lime mortar with metamorphic rock inclusions Islamic – Nasrid***

Bedding and facing mortar samples from the fortress (GRAN24–25) and bedding mortar from the outer enclosure wall (GRAN26) show it all to be essentially the same soft earthy lightish brown-grey 10YR 6/2 gravelly lime recipe. Included also are black 10YR 2/1 charcoal fragments, dissolved organic matter, angular bedrock inclusions 20mm across and white calcinised lime.

Under the microscope these features become more apparent, with sizeable (0.2–0.6mm) angular ‘floating quartz’ set in a fine lime matrix. It is more unusual lithic fragments of metamorphic rocks such as meta-quartzite (Plate 10.5e), gneiss and large minerals of orthopyroxene (Plate 10.5f) and plagioclase feldspar that set these mortars apart from other fortifications in Andalusia. These inclusions come from the underlying Triassic amphibolite and provide an

ideal aggregate for these Nasrid lime mortars in the fortress and enclosure wall.

### ***White plaster Islamic – Nasrid***

The very low-density facing mortar sample from the outer enclosure wall (GRAN27) can be best described as a white 7.5YR 8/1 plaster coating. As well as dissolved vegetative matter, the fine lime mud matrix also holds numerous charcoal rods, clearly seen in thin section.

## **Discussion: Changes in medieval mortar technology: Guadalajara and Andalusia**

### ***Classification of mortars and material availability***

The combined macroscopic and microscopic approach adopted for this study has been successful in identifying different types of mortar and tapial used in the construction of some of the most spectacular medieval fortifications in Guadalajara and Andalusia. Two major mortar groupings (gypsum and lime mortar) have been distinguished, as well as a substantial dataset of rammed earth or tapial materials. Both gypsum and lime mortar binding materials feature heavily in the 101 samples and 74 thin sections taken, reflecting the rich underlying carbonate and evaporite rich Tethyan geology of central and southern Spain.



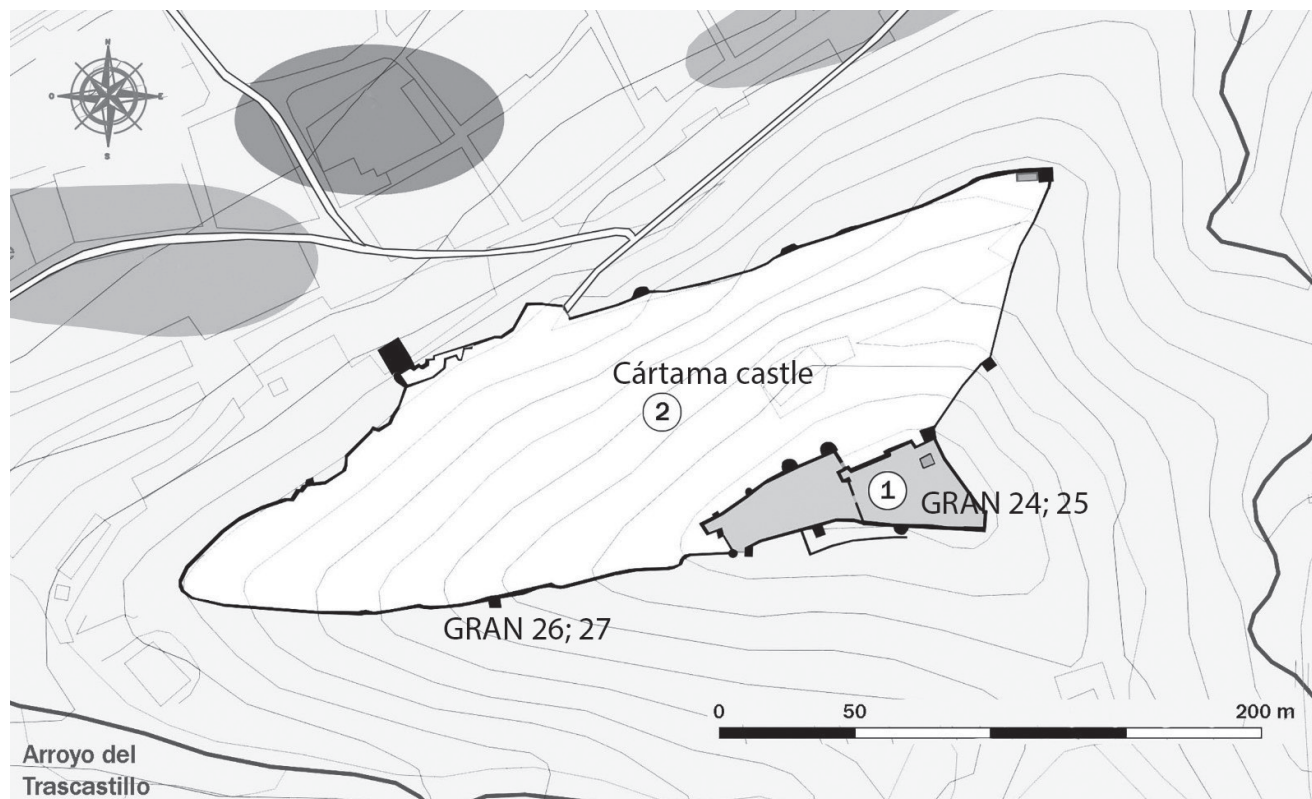


Fig. 10.18. Cártama castle – mortar sample location

In hand specimen gypsum mortars were of low density,<sup>3</sup> with a salmon pink hue and a prickly feel due to many needle-like pink and white crystals of gypsum. In thin section they were found to be quartz deficient with well-formed hexagonal gypsum crystals. Lime mortar is also easily identifiable in the field; having a grittier feel, due to sand inclusions (identified in thin section as ‘floating quartz’), it is also denser with white slacked lime inclusion. Tapial, on the other hand is more friable and earthy with distinctive layers or formwork and dominated in thin section by agglomerated silt size inclusions.

As with earlier work (e.g. Hayward 2019) good understanding of the local and regional geology for the Guadalajara and Andalusia regions made it possible at each fortification to identify the types and sources of aggregate used in the sandy lime mortar and tapial. The reliance on local materials cannot be overstated. For example, in thin section, the composition of the inclusions in the pebbly tapials and sandy lime mortars that define the outer enclosure wall and the towers of the spectacular castle at Molina de Aragón show them to be made of scree talus and fragments of hard dolomite that form the natural promontory on which this castle stands. In Andalusia, too, the origin of the earth used in the earliest Nasrid 1 tapial from Moclin castle is from local Oligocene scree deposits (Olistostromes) containing a

distinctive dark grey mudstone. Although reliance upon local resources in the mortar mix was very much to be expected given the logistical and financial constraints associated with such large, often isolated Islamic and Christian defensive building projects, it nevertheless emphasises the importance of this approach in establishing and reaffirming conjectured source materials.

### *Mortar type and chronological change*

Without doubt the major finding of this study is the link between mortar recipes and specific construction phases at medieval fortifications throughout both Guadalajara and Andalusia. This is especially apparent in the change from gypsum-based mortars and tapials in al-Andalus fortifications to sandy lime mortars and tapials after the Christian conquest in Guadalajara. Indeed, it has been possible to establish (together with the stone construction method) a chronology of mortar types in Guadalajara and Andalusia and at major multi-period fortifications such as Molina de Aragón and Atienza.

### *Islamic gypsum mortars and pebbly tapials*

The earliest towers, all with herringbone walling; the 9th to 10th century Torre de Aragón, Torre Atalaya de Los Casares 30km to the north, the earliest tower at Atienza, Torre



Mojonazo and Torre de Barbatona near Sigüenza use a similar low-density (salmon pink) 2.5YR 6/4 gravelly gypsum recipe in bedding mortar and tapial. Gypsum mortar had advantages requiring a low firing temperature 150°C–200°C, dries fast and resists weathering in a dry warm climate such as Spain, ideally suited to surviving such long periods. The major gypsum outcrop close to Torre Atalaya de Los Casares, extracted during the Andalusi period, provides at least one major source.

The earliest construction phases at Molina de Aragón including herringbone walling and the stone foundation bases of Towers 2 and 4 use a white powdery crushed gypsum mortar. This recipe was also present in the Islamic Torre de Bujarrabal, near Sigüenza, Torre de Membrillera and Torre del Congosto, south of Atienza, supplemented by the isolated Torre Chilluente. Pebbly tapials constructed as formwork in Towers 2 and 4 lie above these at Molina and are probably contemporary.

In a gypsum poor area such as Andalusia, the reliance on different types of tapial are particularly apparent in the Nasrid 1 and 2 phases at Moclin, where mudstone rich and mudstone poor hard lime sand tapials have been especially resilient to weathering and have survived largely intact since its medieval construction. Instead of using gypsum in the mortar the Nasrid 2 bedding mortars at Moclin and Teba use quartz deficient hard lime mortars bonded in either local cemented dolomite or local crushed limestone with tile additive respectively.

### *Christian sandy lime mortars*

The Christian conquests of the Guadalajara region and then Andalusia are marked by a new phase of building of fortifications. This involves the widespread use of sandy lime mortars, dug from local bedrock and heated at much greater temperatures ranging from 850°C to 1200°C. Used along with small petit appareil blocks of stone, particularly evident in the Christian 1 phase at Atienza at the citadel at Teba, the rather poor lime mortar bonding very coarse, large angular grains of quartz meant that the fortified structures were not as resilient as the Islamic gypsum mortar constructions, effectively a downturn in mortar technology. These findings are in line with existing mortar studies from Balaguer (Hayward 2024a, 2024b) and together form a template for further mortar study in medieval Islamic and Christian fortifications not only in the Iberian Peninsula but also in north Africa.

## **Appendix: Definitions of the main groups of medieval Islamic and Christianised mortar and tapial in this study**

**Gypsum mortar** A very fine, low-density malleable gypsum mortar is produced by the heating (dehydration) at between

150°C to 200°C of the naturally outcropping evaporite mineral; gypsum  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  resulting in a 20% loss in water to produce Bassanite  $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$  and artificially produced anhydrite  $\text{CaSO}_4$ . After calcination water is added (hydration) to the bassanite to create a plaster of Paris gypsum powder, or with more water a putty with distinctive acicular hexagonal crystals as seen in thin sections, e.g. Fig. 10.7c (Adams *et al.* 1984, figs 195–196). This mortar does not require aggregate such as quartz, as it remains surprisingly durable.

It requires a lower firing temperature to lime mortar and so is easier to prepare, dries very fast and resists weathering in a dry warm climate such as Spain. The mortar does not shrink or expand readily and has great resistance to fire (e.g. Bel-Anzue and Elert 2021). Workable outcrops of gypsum, although abundant in Spain, are still restricted to specific zones of extraction, meaning these raw materials sometimes need to be supplied over some distance.

**Lime mortar** Essentially the lime in the mortar is produced by the heating of limestone or shell at temperatures of between 850°C to 1200°C transforming  $\text{CaCO}_3$  into  $\text{CaO}$  or ‘quicklime’. The addition of water transforms the chemistry again to form a malleable putty or slaked lime  $\text{Ca}(\text{OH})_2$  that can be spread as mortar which then hardens (Quinn 2013, 224). Each mortar recipe is composed of a fine matrix or binder, particles or aggregates which strengthen the mortar, combat shrinkage during drying and resist physical weathering processes such as freeze-thaw action and voids. In Guadalajara and Andalusia this aggregate is usually quartz or rock fragments, especially hard dolomite, sandstone and the ubiquitous limestone but sometimes igneous or metamorphic rocks. Outcrops of limestone, suitable for lime are far more abundant and accessible than gypsum in Spain, with castles or towers frequently perched on these hard carbonate rocks.

**Tapial** A construction method in dry warm climates relying on the use of dryish earth or subsoil, which along with suitable additives (including human hair and animal bone) is first contained within rectangular wooden shutters 4in to 10in (c. 10–25cm) thick (the formwork). The soil in each shutter is rammed or compacted up to 50% by volume using a long-ranged pounding pole (tamper) or by trampling forming a compacted Tapia or Pisé. Each section is raised in layers up the height of the wall. Suitable portions of clay, silt, sand and gravel improve the consistency, whilst the addition of a lime mix between each block (calicotrada) stabilises it and can be applied on the surface as plaster forming an impermeable barrier but allowing it to breathe. The formwork is removed quickly as the compressive strength of each block is considerable as it cures. This is the principal construction method for the 1232 to 1492 dated Alhambra. The form, colour and durability of each tapial very much depends upon the ingredients within the dryish earth and the surrounding and underlying geology.

## Acknowledgements

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## Notes

- 1 <http://info.igme.es/cartografia/Guadalajara> MAGNA 50 (2<sup>A</sup> Serie) Mapa Geológica de España a escala 1:50 000 Sheets 433 Atienza, 434 Baraona, 460 Heindelaencina; 461 Sigüenza, 462 Maranchon, 463 Milmarcos. 488 Ablanque, 489 Molina, 490 Odon, 513 Zaorejas, 514 Taravilla, 515 El Pobo de Duenahere. Andalusia Sheets 990 Alcala la Real; 991 Moclin, 1008 Montefrío, 1009 Granada, 1037 Teba, 1052 Alora.
- 2 Maps MTN50: 434 Baraona (Castillo de Riba Santiuste); 460 Hiendelaencina (Torre del Congosto); 461 Sigüenza (Torre de Barbatona); 462 Maranchón (Torre de Bujarrabal; Torre Mojonazo); 486 (Torre de la Membrillera); 488 Ablanque (Torre Atalaya de Los Casares; Riba de Saelices; Torre Abalate de Tajuña); 489 Molina de Aragón (Torre Chilluente) 490 Odon (Cubillejo de la Sierra).
- 3 Please refer to the Appendix for a more detailed appreciation of the manufacture, use and advantage of gypsum mortar, lime mortar and tapial.

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## The Upper Frontier (*aṭ-ṭaġr al-a 'lā*) of al-Andalus and the Catalan comital conquest

*Jesús Brufal, Helena Kirchner and Antoni Virgili*

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### Introduction

The purpose of this chapter is to offer a state of the art on the research carried out on the upper frontier of al-Andalus (*aṭ-ṭaġr al-a 'lā*) and, specifically, on its easternmost end, coinciding approximately with the territory of the Andalusī district of Lleida. In many respects, knowledge about the Islamic conquest and settlement has advanced in recent years thanks to the archaeological perspective of recent research, although many questions remain unanswered. The process of feudal conquest is known in terms of its main events and protagonists, although largely as a result of studies that have been little disseminated and are relatively old. Colonisation after the feudal conquest, on the other hand, has not yet been the subject of an in-depth study, beyond written documentation. Unlike other regions, such as the Lower Ebro and Tortosa, there has not yet been a detailed study of the transformations brought about by the feudal conquests. The following lines are intended to be a synthesis of this knowledge and to provide a new perspective, thanks in part to the archaeology of the Andalusī settlements and a new reading of the written documentation.

The upper frontier of al-Andalus (*aṭ-ṭaġr al-a 'lā*) in its easternmost area does not appear to be constituted from an administrative point of view until well after the Islamic conquest, which reached as far as Poitiers. After the Carolingian conquests of Girona (785) and Barcelona (801), the area under the authority of the Christian counts stabilised and was extended until the beginning of the 11th century across areas where the actual settlement of Muslims is almost invisible from the archaeological or architectural point of view, but that were inhabited by Christian communities and in some cases, Muslim groups only attested by toponymy (Barceló 1991) or scarce and scattered finds of Islamic burial sites (Puig 2015; Cubo *et al.* 2021). From the Islamic point of view, the ability of the emirs, and particularly the Umayyad emirs, to keep the frontier areas, known as *tuġūr* (sing.

*al-ṭaġr*), under their authority was scarce and fluctuating, with many problems of revolts by the governors located in the main urban centres (Manzano 1991; Sénac 2000; Lorenzo 2010). Architectural and archaeological remains of cities, fortresses and rural settlements are only dense below the 'line' of the Christian conquest established around 1010 (Plate 11.1).

However, the frontier was not a well-defined line, not even by fortifications, nor was it a succession of lines marking the advance of the feudal armies from the north to south, although it has been depicted as such (Plate 11.1). It was an area permeable to trade and even to frequent relations and alliances with the Carolingian sovereigns or the Catalan counts (Sénac 2000, 2018). At the same time, armed clashes, Muslim raids and, finally, the successive conquests of sites by the Christians pushed back the Islamic authority over these territories. Finally, the Christian conquests were followed by colonisation processes that led to the gradual extinction of the Muslim populations.

### The organisation of the upper frontier of al-Andalus (*aṭ-ṭaġr al-a 'lā*)

#### *From conquest to the Caliphate's organisation of the upper frontier*

In 711, the Berber warlord Ṭāriq ibn Ziyād, and a year later the Arab Mūsā ibn Nuṣayr, began the conquest of the Kingdom of Toledo up to its borders beyond the Pyrenees, in the ancient Septimania, whose city of reference was Narbonne. Although there is evidence of warlike confrontations, capitulation pacts were common, no exception being the territories that would make up the upper frontier of al-Andalus (Sénac 1998; Chalmeta 2003). Approximately between 713 and 714, both banks of the river Ebro were conquered, and from 716 onwards the north-east of the Peninsula and the plains of Septimania, also known as the land of the Franks



(*bilād al-ifraṅḡ*) (Bramon 2000, 151–152). In 734, one of the most active governors of al-Andalus, al-Salūlī, promoted the colonisation of Narbonne and the banks of the Roine by Muslims (Bramon 2000, 163). In the same region, the site of Ruscino has provided relevant data on a possible military camp and the operations for the distribution of the booty of conquest, thanks to the discovery of a collection of lead seals for documents with legends alluding to this distribution (Sénac *et al.* 2014; Sénac and Ibrahim 2017). However, from 732, after the defeat at the battle of Poitiers by the Merovingian army led by Charles Martel, and the instability following the Berber revolt in the mid-8th century and by the rivalry between the Syrians and Yemenis, the territories of Septimania were gradually lost. Narbonne was conquered in 759, followed by Girona in 785 and Barcelona in 801.

As early as 741–742, the Arabic sources mention ‘those of Zaragoza and its frontier’ (Bramon 2000, 164), and the anonymous *Fath al-Andalus* mentions ‘the frontier of Zaragoza’ (Manzano 1991, 46), the precedent of the so-called upper frontier of al-Andalus. The position of Zaragoza in the centre of a large territory running parallel to the Pyrenees and its proximity to the north-west with the Vascons meant that this frontier was organised, after the conquest of Barcelona in 801, around Madīna Saraquṣṭa (Zaragoza) (Manzano 1991, 124–129). In the easternmost sector of this frontier there was not a significant urban centre, except for Tortosa which is not always included by the Arabic texts in the upper frontier but in the *taḡr al-šarqī* (oriental frontier) (Manzano 1991, 52–54; Sabaté 2003, 25). In the process of organising this frontier area, the role of the Banū Qasī, of *muwallad* origin (the native population of the Iberian Peninsula who adopted Islam), was very important (Manzano 1991, 112–118; Lorenzo 2010).

The arrival of the Umayyad Caliphate in al-Andalus with ‘Abd al-Raḥmān III in AD 929 coincided with the end of the *muwallad* line of the Banū Qasī in Lleida, a fate that their rivals of the same social origin, the Banū al-Ṭawīl of Huesca, shared in AD 935. Both lines ruled these districts from the second half of the 9th century and, beside their rivalry from the 870s, they had a number of conflicts with the Umayyad dynasty. In the 10th century, by order of the Caliph, the government of these districts passed to the Banū Tuḡṭbī. This Arab lineage had been related to the Umayyads since the 9th century, when they were called upon to occupy the fortress of Calatayud (Qal‘at Ayyūb) and, from there, to take by force the government of Madīna Saraquṣṭa in 890 (Manzano 1991, 128).

### ***The Caliphate’s policy in at-taḡr al-a ‘lā***

The Caliphate’s policy of friendship with the Banū Tuḡṭbī changed soon, especially from the decade of 930 onwards, because of their protests and uprisings against the centralised control of the Caliphate’s administration and taxation. The Caliphate’s reaction was to make frequent rotations and

changes in the governorship of the upper frontier districts. Another characteristic feature of the governors of the border districts is the public or secret links, as Ibn Hayyān rightly points out, with the so-called ‘unfaithful’ of the Christian county society. The documentation records how Muḥammad ibn Hāšim, governor of Lleida, established contacts with the Catalan counties, especially with that of Barcelona. The Caliph’s pardon for these malpractices was based on a set of conditions: readmission to the administration, in this case with the government of Madīna Saraquṣṭa, the obligation to participate in all military expeditions, and the prohibition to establish peace agreements with the Christian kings or counts, except with the express consent of the Caliph (Bramon 2000, 287). This behaviour was not new, since the *muwallad* lineages, especially the Banū Qasī, had previously established kinship ties with the aristocratic lineages of the Kingdom of Pamplona, and before these, in the 8th century, Berber chiefs had made pacts with Visigoth aristocrats. These links between the elites of the border societies of al-Andalus and the Christian kingdoms and counties had probably to do with the demographic weight of the population of indigenous origin. The upper frontier of al-Andalus was not, therefore, an impassable boundary in the 10th century. For this reason, ‘Abd al-Raḥmān III developed an intense policy of attacks and plundering of sites and territories belonging to the Catalan counties, with the naval and land campaign of 935 in which the Caliph’s fleet heavily attacked the county of Empúries, one of the most vigorous in this historical context; the city of Barcelona and the Llobregat river delta (Bramon 2000, 278–279). This military strategy persisted throughout the 10th century, accompanied by two novelties: with ‘Abd al-Raḥmān III, expeditions were carried out by small armed contingents that could attack various sites at the same time along the frontier. The second novelty is the intensity in time and space of Al-Manšūr’s campaigns throughout Iberian Christian territory, especially against the county and city of Barcelona (978), the county of Girona (982) and the county of Pallars (999).

The damage inflicted by this raiding strategy was not enough to weaken the institutional and economic structures of the Catalan counties, since it was not accompanied by a process of conquest. Precisely in the 10th century, the earlier movements of the county towards the border with the Andalusī districts of Lleida and Tortosa took place with the clear purpose of occupying these territories (Sabaté 1996, 68–76). However, the military hegemony of al-Andalus led to the establishment of various peace treaties.

The news of the death of Al-Manšūr in 1002 may explain why the Catalan counts saw as more feasible the military incursions into the Andalusī territory of Lleida. Thus, in 1003, the Battle of Albesa, an Andalusī settlement and fortress, took place between a coalition led by the Count of Urgell Ermengol I, the counts of Besalú and Cerdanya and, probably those of Ribagorça and Pallars, against Lleida’s

Caliphate troops. The result of the battle was the death of Berenguer, Bishop of Elna, but also a challenge to the Caliphate's power (Bramon 1995, 25–27). In the summer of the same year the attack was answered by 'Abd al-Malik, son of al-Manšūr, who conquered Montmagastre and Meià – small fortifications located at the southern border of the County of Urgell, near the river Segre. 'Abd al-Malik promoted a process of colonisation in these castles, with the settlement of Muslims to whom he offered houses and land (Bramon 2000, 345–348).

The border of the Lleida district was particularly fragile in its north-eastern sector, along the river Segre and its tributaries. In 1006, 'Abd al-Malik had to face an armed coalition led by the Count of Urgell Ermengol I, Bernat Tallaferro, Count of Besalú, Guifré, Count of Cerdanya and Ramon Borrell, Count of Barcelona. The Catalan counts rapidly conquered Montmagastre and Alòs (1018) and Guissona (1024). Thus, the city of Balaguer, the fertile plain of Guissona and the so-called Faḥṣ Maškīgān of Lleida remained exposed.

The *fitna* of 1009 ushered the institutional crisis of the Caliphate and the birth of the Taifa powers. Initially, the Andalusi district of Lleida was ruled by the Banū Tuğībī, who maintained the unity of the upper frontier territories. A few years later, in 1017, a supposed Arab lineage, the Banū Hūd, led by Sulaymān ibn Hūd (Viguera 1981, 185) counted on the support of the 'people of Lleida' (*aḥl al-madīna*) to expel the Banū Tuğībī from the government of the city and the district. The Banū Hūd maintained good relations with the Banū Tuğībī of Zaragoza and supported Caliph candidates sympathetic to the Umayyad cause. This positioning of Sulaymān enabled him, in 1039, to storm the government of Zaragoza and he became the ruler of the territories of the entire upper frontier of al-Andalus. However, the process of conquest initiated by the kings and counts, especially the latter, of the entire border territory forced these Taifa lineages to seek alliances in southern Andalusi territories like Denia (Sabaté 2003, 106–121).

After his death in 1046, Sulaymān ibn Hūd left the districts of the upper frontier divided among his sons: Saragossa to Aḥmad, Calatayud to Muḥammad, Huesca to Lubb, and Lleida to Yūsuf al-Muẓaffar (Maíllo 1993, 185–187). From this time until the Almoravid conquest of the district of Lleida in 1102, the clashes between the brothers and then their respective sons contributed to the weakening of the frontier (Plate 11.1).

### Andalusi settlement in the frontier territory

#### *The consolidation of the cities in the eastern part of the upper frontier*

The cities of the eastern part of the upper frontier began to be visible in Arabic chronicles in the second half of the 9th century, when the first references to fortification activities are documented. During the 9th century, Madīna Lārida,

built on the site of the abandoned Roman Ilerda (Lleida), became the centre of a district dotted with *ḥuṣūn* (rural fortifications). According to al-Ḥimyarī, around 883–884, Lārida began to be reconstructed and the *sudda* (citadel or urban fortification) was probably built (Bramon 2000, 226). The city had been destroyed in the 800, along with Huesca, by a Frankish expedition led by King Ludovicus (Manzano 1991, 92). In the Spanish version of the chronicle of 'Isā b. Aḥmad al-Rāsī (888–955), it is said that the city of Lleida had several castles (pl. *ḥuṣūn*, sing. *ḥiṣn*) in its administrative district and Balaguer was one of them (Bramon 2000, 130–131). The *ḥuṣūn* have been considered central defensive structures in the organisation of the frontier. Built between the 9th and 10th centuries, they were usually located in places with dominance over waterways and communication routes and served the function of defending rural communities (Sénac 1988, 1991; Giralt 1991, 71).

Little information is available on the initial stages of the Islamic settlement in Balaghī (Giralt 1994, 219–226; Alòs 2020). The first documentary reference dates from AD 863 when, during the transfer of the body of Saint Vincent from Saragossa to the monastery of Castres (Septimania), the monk Aimoinus from Saint Germain des Près, who wrote the chronicle, explains how, on passing in front of the *oppidum* of Balaguer, a crowd came out to venerate the body of the saint and a woman miraculously recovered her sight. This *oppidum* would be the Pla d'Almatà which, according to some authors, would already have been walled at this date (Giralt 1994, 220; Alòs 2015). The written sources from the Andalusi period that mention the settlement of Balaguer first refer to it as a *ḥiṣn*. Ibn Ḥayyān (988–76), following the chronicle of al-Rāsī, narrates how Lubb b. Muḥammad b. Lubb b. Mūsā b. Qasī, lord of the upper frontier, clashed with Guifré el Pelós, the Count of Barcelona, and killed him in 897. According to Ibn Ḥayyān, he began building the *ḥiṣn* of Balaghī in the same year (Bramon 2000, 238–240).

Turtūsa was a city loyal to Córdoba during the *fitna* and does not seem to have been the subject of fortification initiatives until the 10th century. In 945 a state arsenal was built, and a wall was constructed around the suburbs that had grown up to the north and south of the *madīna*. The Caliph's intervention in Tortosa also involved the construction of a new mosque in 956 (Garcia Biosca *et al.* 1998) (Plate 11.2).

So, according to the sources, in the 10th century the three cities, like others in the upper frontier, were urbanised with walls, citadel (*sudda*), mosque and suburbs (Garcia Biosca *et al.* 1998). In all three cases, material remains from before the 11th century are scarce and residual in the excavated habitation areas. A similar urban development can be described for the three cities. The excavation of the site of the Antic Portal de Magdalena in Lleida is particularly significant (Lorient *et al.* 1997). In the habitation areas, traces of the earliest settlement have been found in the form of silos and cesspits, abandoned and filled during the 10th century and

located in a manner consistent with the layout of the streets and the dwellings built later in the 11th century.

In the Pla d'Almatà, the signs of occupation prior to the 11th century consist of levels located below the 11th-century pavements, silos, a few badly razed walls and residual ceramic materials (Cau *et al.* 1997; Alòs *et al.* 2007). Some of the skeletons excavated in the *maqbara* have also provided early dates. Likewise, the dating of a wood spire from the rammed earth of the wall of the Pla d'Almatà places its construction before the 10th century (Fig. 11.1).

In the suburb located on Carrer Montcada in Tortosa, occupation took place as early as the 10th century, although most of the buildings, orthogonal streets and the sewage system date from the 11th century and were in use until the middle of the 12th century, when the feudal conquest took place (1148) (Bea *et al.* 2011). Except for a building of unknown function excavated in the Nostra Senyora de la Cinta square, which was dated to the 7th and 8th centuries, the buildings documented so far have no chronology prior to the end of the 10th century (Curto *et al.* 1986).

The preserved urban design of these cities dates mainly from the 11th century, when the houses adopted the characteristic layout around a closed courtyard, which is well documented in Lleida and Balaguer (Fig. 11.2). On the other hand, the walls and the citadel (*sudda*) have construction systems that can be dated to at least the end of the 9th century, and written documentation provides references to their construction, as well as to some other buildings. In the 11th century, probably in connection with the consolidation of the urban layout, modifications were made to the citadels. This evolution can best be seen at Castell Formós de Balaguer, where the late 9th-century fortification was remodelled, and a palace was built inside it in the 11th century (Plate 11.3).

In the context of the cities of al-Andalus and those of the upper frontier of al-Andalus, Madīna Balaghī has its own specificity as a city and as an archaeological site. It has been considered, on the basis of the construction system of some sections of the wall, without parallel in al-Andalus, and its size (27ha), that it was first established as a military camp linked to the campaigns of conquest which, via the river Segre, reached French Septimania (García Biosca *et al.* 1998, 146). Other authors have linked the construction and maintenance of this camp to the need to face the Frankish campaigns (Giralt 1994; Esco *et al.* 1988) (Fig. 11.1, Plate 11.4). At the beginning of the 12th century, when the Christian conquest took place, Madīna Balaghī occupied also the current city centre of Balaguer and reached around 40ha.

However, this great city is not mentioned as such until later. Al-'Uḍrī (d. 1085) describes it as a fortress, together with Monzón, Barbastro, Algerri and others (Bramon 2000, 267), Ibn Hayyān (987–1076) also describes it as a fortress when he mentions the appointment, in 935, of 'Abd al-Rahmān b. 'Abd Al-lah b. Waddāh as governor of Lleida,

of the fortress of Balaguer and other castles (Bramon 2000, 283). Ibn Gālib (12th century) mentions it as a city, in the Segre, dependent on Lleida (Bramon 2000, 134). Yâqūt (d. 1229) mentions it as a town in the jurisdiction of Lleida comprising numerous fortresses (Bramon 2000, 105). And not a single source qualifies the settlement as a military camp.

### ***Fortresses in the eastern upper frontier***

The Andalusi district of Lleida was defended by fortresses located on the northern and eastern borders. In the documentation of the 9th and 10th centuries there are several references to the construction or reconstruction of walls, towers and fortresses. Only the construction of the masonry tower built at La Saira in Almacelles is well dated to the 9th century (Brufal 2016, 27). The tower of Els Budells in Massalcoreig is of the same construction type as La Saira and, on the surface, fragments of Andalusi glazed pottery of the partial *cuerda seca* type and glazes in mellow and manganese have been found. This tower stands on a hill overlooking the final course of the river Cinca, before the confluence with the river Segre. From this position, the fortress of Mequinensa, the village of Torrent and the city of Fraga can be seen. The tower of La Ràpita in Vallfogona de Balaguer is a defensive construction made of large stone ashlar. This site, located on a hill on the left bank of the river Segre in front of Balaguer, was a *ribāt* (Brufal 2007, 48–50), whose function was defensive and pious (De Epalza 1994, 16–27). The upper frontier of al-Andalus was a territory of *ribāt*(s) in which individuals who practised jihad and died are documented (Bramon 2002, 344–345). Even so, Mequinensa, Tamarit de Llitera, Benavarri, Monzón, Alguaire, Algerri, Àger, Barbens, Castellldans, among others, apparently constitute a fortified network to defend against county incursions. In the case of Tamarit, Castellldans, Àger and Barbens, it is easy to identify in the walls the mixed construction technique of ashlar and earthen rammed walls (*tapial*), characteristic of many Andalusi buildings (Brufal 2013, 305–320; 2018, 28–39). Gebut is a particular case. This settlement has been identified as an Andalusi fortress, rectangular in plan with the main axis oriented north–south. The wall of ashlar stone and rammed earth is also accompanied by four towers at the apexes and others in the middle of the long ends (González 2018, 14). This site is exceptional for its location on the right terrace of the river Segre, in its final stretch, far from the northern and eastern border of the Andalusi district of Lleida, and in a highly occupied region (Plate 11.5).

### ***Rural settlements in the eastern upper frontier***

Rural Andalusi settlements are located in places where it is easy to obtain water and, in the case of the Lleida plains, the Faḥṣ Maškīḡān, Llitera and Guissona, they take advantage of non-saline water sources. This is important because the water in these areas is usually saline due to the



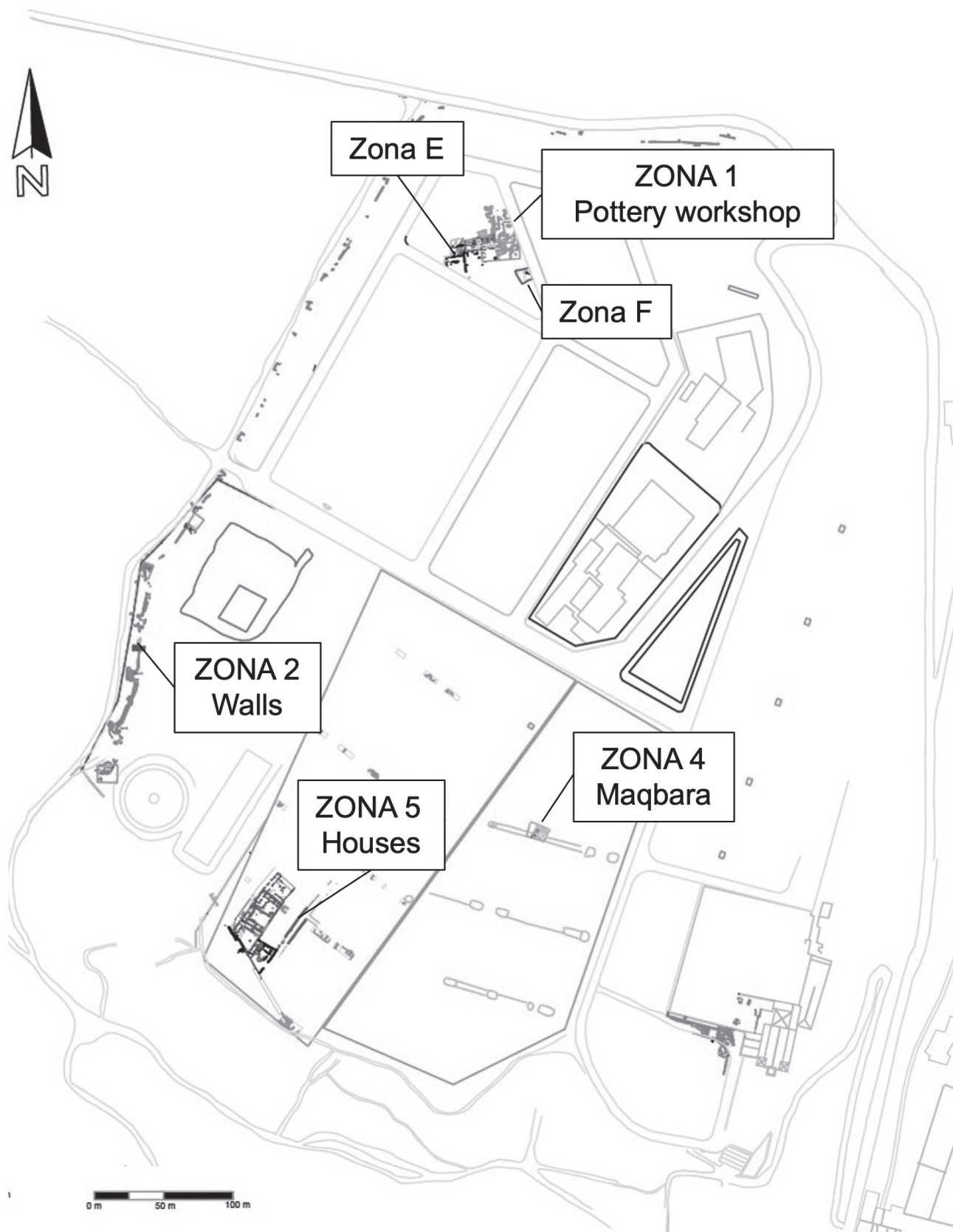
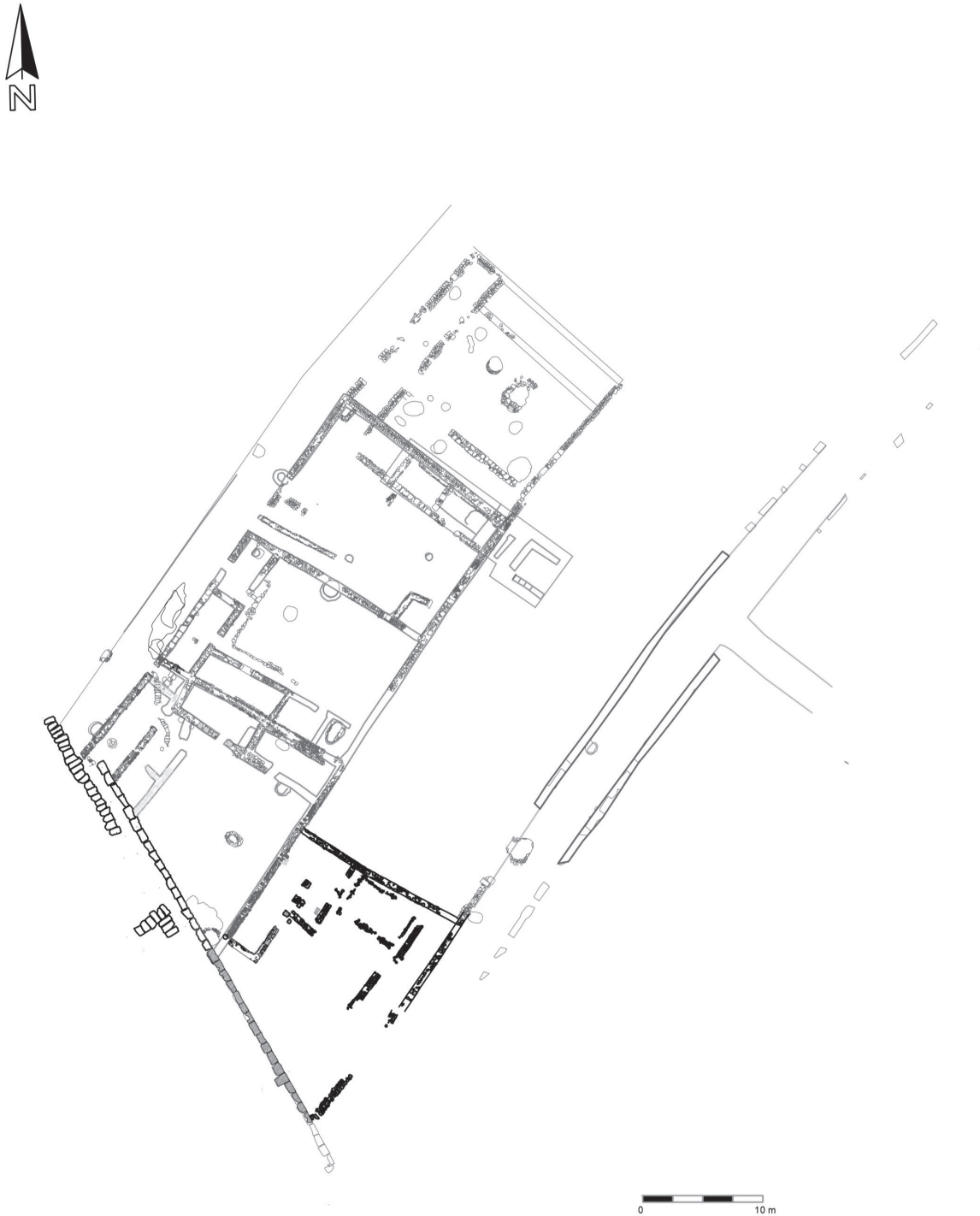


Fig. 11.1. Plan of the Plà d'Almatà site (Balaguer). Zone 1: pottery craft area; Zone 2: walls; Zone 4: maqbara; Zone 5: houses



*Fig. 11.2. Plan of the excavated houses of Madīna Balaghi in an orthogonal layout of streets*

gypsiferous and bicarbonate nature of the soils (Mayoral 2016, 103–114). In the Faḥṣ Maškīgān, the concentration of settlements is located near freshwater springs, such as the Fondarella, the pond south of Mollerussa, ‘La Font Bona’ in Torregrossa and the ‘Font’ in Linyola (Brufal and Cantarell 2019, 101–102). However, the endorheic basins, or

small lagoons with saline water, were excellent pastures for livestock. In micro toponymy, we can identify some terms such as ‘Clot’ or ‘Llacuna’ that refer to these lagoons. The toponyms Utxafava, Marcafava and Margalef, with Arabic roots, also refer to these wetlands (Plate 11.6). In the Llitera plain (province of Huesca), also a territory of the former

district of Lleida, there are numerous rural settlements in the vicinity of the Cinca river course, and on the plain, especially in the vicinity of old endorheic basins (Laliena and Ortega 2018, 113–118).

In 12th-century Latin documentation, Islamic settlements are described as *castra*, *turris* or *almunia* (Eritja 1998). The term *alqueria* (from Arabic *qarya*) is not used like in other regions of al-Andalus. Some settlements with anthroponyms could correspond to *almunias*, cultivated areas belonging to people associated with the city and administrative structures (Eritja 1998; Sénac 2000). However, most of these sites cannot be located due to the profound transformation of the landscape following the introduction of mechanised agriculture in the 20th century. Consequently, the location and description of Andalusi rural settlements is based on the information provided by Latin documentation, toponymy and anthroponymy (Brufal 2013, 297–350). However, the term *almunia* does not necessarily imply a residence; it can solely refer to a parcel of land. Latin documentation calls the *almunia* of Jaz the site of Salaverd (Os de Balaguer) (Mora and André 2022, 35–36), but only a Roman villa has been found in the area. This case reveals that scribes and feudal aristocracies used the word *almunia* to refer to a range of rural properties, without differentiating its use. The *almunia* of Jaz could have been a rural property that inherited Roman agrarian structures.

Al-Ḥimyarī is the Arab author who gives the most detailed description of rural settlements in the western frontier, referred to as the Faḥṣ Maškīḡān (Mascançà):

The city of Lleida is fertile despite the aridity [of its surroundings], has numerous gardens and abundance of fruits, and specialises in [the cultivation of] flax, which is excellent, and it is exported to all the territories of the frontier. In the plain of Faḥṣ Maškīḡān there are many towers (*burġ*) with crops and pastures. (Bramon 2000, 86)

The *sudda* (*hiṣn*) (of Lleida) overlooks a wide plain, known as the plain of Mascançà (Faḥṣ Maškīḡān). [...] All the farmhouses (*ḡay'a*; *sing. diyā'*), without exception, have a tower (*burġ*) or an underground shelter (*sirdāb*) where the inhabitants hide from the enemy. The people of the frontiers depend on money from pious bequests and alms for their construction. (Bramon 2000, 113)

According to the text of al-Ḥimyarī, these rural settlements, called *ḡiyā'*, had a defensive architecture, probably towers, although he also mentions the use of underground shelters, which have never been found to date. According to Dolors Bramon, the origin of the word *sirdāb* is Persian and could refer to silos or small artificial caves for storing crops (Bramon 1992). In some regions of North Africa, the term *zerdab* is recorded which refers to a small silo excavated in the soil and to store small quantities of cereals (Sigaut 1978, 120–121). The description of al-Ḥimyarī is coherent with the term *turris* used in the post-conquest documents.

Remains of towers can still be seen at the Tossal Solibernat site in Torres de Segre, at the Zafranales site in Fraga, at the old Guàrdia de Déu in Guàrdia d'Urgell (Tornabous) and at the Torre de Vilves in Artesa de Segre. In the two first cases, only a row of quadrangular masonry blocks of the tower has been preserved, located at the eastern end of the settlement. The archaeological excavations carried out at the Tossal de Solibernat allow to identify it as a fortified rural settlement, with some rooms around a central courtyard (Rovira *et al.* 1983–1984, 234–245; Rovira *et al.* 1997, 106–107).

However, the role of both settlements is still open to debate, as they are also considered to be possible *almunias* (Ar. *al-munya*) and fortified settlements (Laliena and Ortega 2018, 117–118). The finding of a set of metal pieces like arrowheads or shield appliques has led to the conclusion that the site was occupied by a military detachment (Rovira *et al.* 1997, 105–107). Both sites share the same plan and dimensions, roofs without tiles, construction techniques and defensive and agricultural use. In Zafranales, the carpological findings show quite a significant variety: peach, figs, walnuts, pine nuts, olives and cereals, and the remains of recovered fauna include livestock (bovids, ovicaprids, suids, chickens and ducks), and wild species which would have been hunted or trapped (wild boar, rabbit and hare) (Montón 1997, 191–198). These remains demonstrate a focus on agrarian production and livestock husbandry alongside a significant role for hunting and gathering (for pine nuts and possibly walnuts). In any case, the size of the group that inhabited this settlement should have been small, and they could have been a peasant group even if they were armed.

La Guàrdia de Déu is a free-standing tower with a quadrangular plan and a base made of ashlar with poorly cut stone irregularly laid out in headers and stretchers, although it could have been made of reused material. The upper half of the tower has been rebuilt with small masonry, a characteristic technique of county buildings. The tower of Vilves has a square base, the first layers of which are made of large ashlar, while the central and upper parts are made of masonry, again typical of the county building technique (Brufal 2013, 314–315). Both towers could be associated with rural settlements. Neither building has been precisely dated.

In the Andalusi district of Lleida, as many as eighteen early medieval Christian cemeteries have been found that have a phase of use in an Andalusi context. The cemetery of Santa Coloma d'Àger stands out as a large funerary area built around a late antique basilica (Bertran and Fité 1986, 203–220) (Plate 11.2). From the last third of the 7th century to the beginning of the 11th century, inhumations spread around this complex, with individuals buried in simple and anthropomorphic graves, well aligned on the ground, sometimes forming clusters (Brufal and Porcheddu



2014; 2015; González 2018). Studies of collagen isotopes and incremental dentine have begun to make it possible to identify the diets and thus the nature of the cultures in the Àger valley (Olivé 2023). The Arabic texts also provide information on rural communities with a Christian population. In 975, a conflict broke out in the Christian community of Castillonroy (Ḥiṣn al-Roṣo) over the payment of the *ḡizya*, the tax paid by Christian subjects (Bramon 2000, 325–327). These Christian communities had a judge to settle their own disputes. In 987, the deacon Fortuny, who was called *iudex cunctis christianis Leridense*, established an agreement between the communities of Aguilaniu and Josseu, near Benavarri, over the possession of a salt well (Bramon 2000, 338). On the other hand, Islamic cemeteries have only been identified in urban areas, such as the *maqbara* of Balaguer (Olivé *et al.* 2020, 235–268).

### Christian conquests of the Lleida and Tortosa area and cities

#### *Conquest efforts until the beginning of the mid-12th century*

From the second half of the 9th century, the post-Carolingian society of the counties of the Pyrenees was immersed in a social and economic dynamic that promoted the expansion of the agricultural areas with land clearing and territorial seizures, but without reaching the frontier. These initiatives were particularly intense in the counties of Pallars and Ribagorça (Salrach 1988, 147). In the 10th century, the counties had scarce capacity for territorial expansion. The strength of the Umayyad Caliphate of Córdoba, together with the political limitations of the counts due to a powerful aristocracy and ecclesiastical domains, made it difficult to initiate military projects (Freedman 1985, 33–34; Marquès 1993, 116). Nevertheless, there are discrete attempts to establish peasant settlements in the border area, clearly visible in the first decade of the 11th century. On the one hand, peasants ploughed land within the territorial boundaries of their feudal lord's castle, and on the other, they occupied and exploited properties on the border, outside their lord's control (Sabaté 1996, 71).

At the beginning of the 11th century, the frontier began to break down and the barons began to promote initiatives to colonise these territories with peasants in order to occupy and exploit these lands. The colonisation initiatives were organised thanks to the resources provided by the increasingly well-defined structure of castral territories (the *termini* of the *castrum*). In the 11th century, castles were located on high, well-protected sites. Circular towers and small fortresses had been built to defend against raids or larger military campaigns organised from the Andalusí side (Bonassie 1979; Benet 1988, 81–83). Gradually, the strength of the counts increased thanks to the evolution of feudal relationships and the accumulation of wealth resulting from

attacks on Andalusí territory, including that of Córdoba in 1009 (Ibn 'Idārī 1993, 88–89). The Church also took part in these actions, such as in the conquest of Guissona by Bishop Ermengol of Urgell in 1024 (Verdés 1993, 24–33). On the other hand, baronial power is evidenced when Ermengol, the Bishop of Urgell, and the lord Guillem La Vansa faced each other in a lawsuit in 1024. In the preserved document, Ermengol explains that Guillem appropriated lands that the bishop considered to be his after the conquest of the city of Guissona. The bishop defended himself against Guillem's aggression by explaining that he led the conquest of this town involving a substantial effort (*de minibus paganorum multo labore abstraxerat*) (Sangés 1980, 228).

The conquest of the territory of the valley of the river Segre, to the north of the city of Balaguer, during the first decades of the 11th century was promoted by the counts of Urgell and Barcelona (Plate 11.7). In 1018, the Count of Barcelona Ramon Borrell, as guardian of the young Count of Urgell Ermengol II, conquered on his behalf the castles of Alòs, Rubió and Malagastre (Baraut 1994–1995, 112–113; Fité 1994, 365). However, it has been proposed that the Count of Barcelona Ramon Borrell was the only conqueror of these castles because he took an active part in the expedition against Abd al-Malik, who was defeated in 1006 or 1007 by the coalition of the counts of Barcelona, Besalú, Cerdanya and Urgell. The victory brought these fortresses under the rule of the Count of Barcelona, but he gave them in fief to the Count of Urgell, Ermengol II (Benet 1991, 390). In 1039, the Count of Urgell Ermengol II sold the castle of Artesa to Arnau Mir de Tost. In this document, the count explains that this fortress *nobis advenit ad me, iam dicto Ermengauda, de genitores meos sive aprisione* (Chesé 2011, 211–212). This is interesting because before 1010, the year of the death of the Count of Urgell Ermengol I, this castle was already part of the assets of the County of Urgell.

In the mid-11th century, the progress of the conquest intentionally broke the unity of the Faḥṣ Maškīḡān, in the Andalusí district of Lleida. The Count of Barcelona advanced towards Lleida, throughout the County of Manresa, with the aim of limiting the southern expansion of the Count of Urgell and he infeudated three main castles and towns: Cervera, Tàrrega and Anglesola. The castle of Anglesola was infeudated by Count Ramon Berenguer I to the lord Berenguer Gombau, with the task of occupying and exploiting its territory (Sabaté 1998, 11). This same purpose can be seen with the incorporation of the castles of Camarasa and Cubells into the dominions of the County of Barcelona in 1050 (Ordeig 2016, 526), following a pact between the count and the governor of Lleida, Yūsuf al-Muẓaffar (Benet 1982, 57–58).

Meanwhile, the Count of Urgell, Ermengol III, incorporated the valley of Àger into his realm in 1034, and his vassal, Arnau Mir de Tost, conquered several castles in Ribagorça (Fité 1985, 106–107). In this same area, in 1037,

the fortress of Santa Linya was incorporated into the County of Urgell (Chesé 2011, 205–206), a strategic point that saw the encirclement of the city of Balaguer together with two other fortresses, Sant Llorenç and Gerb.

South of Guissona and bordering the limits of the County of Barcelona in the Faḥṣ Maškīgān, the Count of Urgell incorporated the Almenara mountain range into his domain and also organised the settlement of Fuliola in 1080 on the northern border of the Faḥṣ Maskigan (Lladonosa 1980). Once he consolidated these positions, he oriented his interest to Balaguer: in 1082 Count Ermengol IV of Urgell conquered Gerb and in 1091 he annexed La Ràpita (Sabaté 1996, 80) with the clear purpose of taking over the city.

Balaguer resisted the attacks of Arnau Mir de Tost and was briefly occupied twice: by Ermengol V of Urgell (1097) and by Guerau II of Cabrera (1100–1101). The city was finally occupied in 1105. The military operations were led by Ramon Berenguer III of Barcelona, Pedro Ansúrez, Count of Valladolid, who governed the County of Urgell during the minority of his grandson Ermengol VI, and Alfonso the Battler of Aragón. The city was occupied, and the population was expelled or taken into captivity (Bertran 2007). The conquerors proceeded with the distribution of the spoils: the Count of Urgell kept half of the city and its territory, whilst Guerau Ponç II of Cabrera, the Viscount of Àger, was given a quarter of the city and rights in the *sudda* (fortified citadel), which he shortly afterwards infeuded to Arnau Berenguer de Anglesola. The Bishopric of Urgell also received a quarter of the city and its territory. Land was granted to other religious institutions, such as the monastery of Sant Serní de Tavèrnoles. But the process of colonisation was very slow. The surrounding castral districts were also created: Os de Balaguer, Castelló de Farfanya, Llorenç, Algerri and Almenar (Bertran 2007, 172).

At the beginning of the 12th century, the county's territorial expansion had reached Balaguer and Tarragona, and the most important military effort was directed at Tortosa. Berenguer Ramon II had attacked it between 1090 and 1093, promising to allocate 50,000 *nummi ex expolia Dertose* for the restoration of Tarragona's bishopric. However, it seems that the main aim was to plunder and seize booty, rather than to achieve a permanent conquest. The first plan to occupy Tortosa was drawn up by Ramon Berenguer III of Barcelona between 1097 and 1098. The few written documents reveal the formalisation of military alliances in anticipation of a future division of territory and the organisation of the bishopric. The enterprise failed because of the Almoravid intervention (Virgili 2001, 37–42) (Plate 11.1). Theses military enterprises must be related to the expansion of Latin Christendom in the Mediterranean with the Norman conquest of Sicily, the First Crusade into the Levant, into the lands of the Western Slavs in the Baltic Sea region, into Wales and Ireland with the Anglo-Norman conquests, and into al-Andalus (Bartlett 1993).

After a quarter of a century of unsuccessful attempts, Count Ramon Berenguer III decided to reinvigorate the occupation of Tarragona. In 1118, he granted Oleguer, Bishop of Barcelona and Archbishop of Tarragona, the church, the city and the district, which had been 'destroyed, barren and abandoned for many years', with the aim of encouraging its colonisation. To overcome the difficulties facing the process of colonisation, the archbishop gave the city and the district to a Norman knight, Robert Bordet, who had taken part in the conquest of Zaragoza (Villegas-Aristizábal 2018). Even so, progress was rather poor, and, strictly speaking, the occupation of the Camp de Tarragona did not take place until the second half of the 12th century.

The conquest of Tortosa and Lleida required a significant military effort and the investment of considerable resources. Towards the middle of the 12th century, Ramon Berenguer IV of Barcelona devised a plan to conquer the two cities. He took advantage of a favourable context: the power crisis of the Almoravids and the preaching of a new crusade. Pope Eugene III issued the bull *Quantum Praedecessores* in 1145 to launch the Second Crusade to the Holy Land (Phillips and Hoch 2001; Phillips 2007). Bernard of Clairvaux, one of the most important figures in the Cistercian Order, was the visible head of a network of preachers who spread the message throughout the regions of feudal Europe. At the same time, the Pope addressed a letter to the Christian faithful of the Catalan counties, exhorting them 'to fight against the infidel enemies of the Cross of Christ' and 'to accompany the noble Ramon' (Ramon Berenguer IV), Count of Barcelona, 'in the defence of the Christian faith and the Holy Church', and promising them the same benefits that Pope Urban had granted to those who had participated in the liberation of the Eastern Church. He also placed the relatives and property of those who would take 'the path' or die on it under the protection of the Fathers of the Church and granted them remission of sins. The letter was written on 24 June, probably in 1147 (Virgili 2001, 45).

In the context of this crusade, Eugene III's *Quantum Praedecessores* contains a concept found in other contemporary texts that reflects a new attitude towards the conquered: the *expurcitia paganorum* (purification of the pagans). It is a message clearly aimed at the liquidation of the populations targeted by the conquest (Barceló 2005). This formula became visible from the Second Crusade onwards, especially in al-Andalus, an experience that entailed, in the short or long term, the extinction of the natives and their replacement by Christian settlers from the conquerors' regions of origin (Torro 2000, 2008; Virgili 2010).

### ***The military campaigns of Tortosa and Lleida (1148–1149)***

The scarcity and dispersion of written sources make it difficult to reconstruct the operations led by Ramon Berenguer IV to organise the military campaigns of Tortosa and Lleida

(Lladonosa 1991, 89–123; Bolòs 1997, 37–48; Virgili 2001, 46–58; Eritja 2003, 293–313). The first actions were directed towards the formation of combat contingents. The assault on large cities required the support of powerful allies to supplement the county's troops. Alliances were formalised with the Republic of Genoa for the Tortosa campaign (Virgili 2001, 50–53; Ferrer Mallol 2009, 151–239) and with Ermengol VI, Count of Urgell, for the Lleida campaign. In both cases, the allies agreed on a share estimated at one-third of the two cities and their respective territories, while Ramon Berenguer IV reserved the remaining two-thirds for himself. The presence of the bishops of the main dioceses and knights of the Templar and Hospitaller military orders has been documented at both sieges.

The county army was organised by means of specific agreements with representatives of the Catalan and Aragonese aristocracy, the latter to a lesser extent. Furthermore, companies of Norman crusaders are attested in Tortosa. Their destination was the Holy Land as part of the Second Crusade. They had gathered in the port of Dartmouth (southern England), took part in the siege of Lisbon (1147) and then in Tortosa. Their presence has given rise to numerous documentary testimonies, and their contribution to the process of colonisation of the Lower Ebro region was notable (Virgili 2009).

According to the Tortosa capitulation document, the Andalusí people could remain in the region with their own property, under the authority of the count. Within a year, however, they had to leave the city and move to an outer suburb. Those who had fled could return and recover their property if they did so within four months. They could graze their cattle on the count's land. The community was endowed with a specific legal system (*aljama*), which would have its own elected officials and laws, its legal rights would be respected without interference from Christian jurisdiction, and its freedom of worship would not be restricted, except for having to cede the main mosque of the city. As for tax obligations, they had to pay the tithe on crops and livestock and were exempt from the *sofra* (provision of days' work or equivalent value for public works) (Serrano 2000). This exemption, however, was revoked in 1178 with the imposition of a tax of 400 gold *mazmudine* per year, proportional to the demographic volume of the community and, therefore, subject to variation (Virgili 2001, 126–128). The conquest of Tortosa meant the control of the adjacent regions. In the last offensive, Bertran de Castellet and Guillem de Castellvell, on behalf of the Count of Barcelona, took Siurana and Prades, and the Templars did the same with Miravet (1153).

As far as the occupation of Lleida is concerned, everything points to an operation similar to that of Tortosa. The main ally of Ramon Berenguer IV was the Count of Urgell, Ermengol VI, and Arnau Mir, Count of Pallars, also took part. Some of the great barons participated in both sieges, such as

Guillem Ramon de Montcada and Ramon de Sentmenat. The siege of Lleida lasted almost six and a half months (from the beginning of March to the middle of October 1149) and ended with the capture of the citadel (*sudda*). The permanence of an Andalusí community in the suburbs of the city, as well as the existence of some rural communities, suggests that a negotiated surrender may have taken place, but the drafting of a document, as in Tortosa, is unknown (Mutgé 1992, 1–2; Eritja 2000). In this area, Lleida and Fraga were the last conquests after those of the surrounding castles and towns (Plate 11.1).

### *Managing the conquered territory*

Military campaigns were followed by the management of the indigenous population, the territorial and jurisdictional division between the participants (*repartiment*),<sup>1</sup> and colonisation. These processes took place simultaneously and were interrelated. The military actions were preceded by the prior constitution of an army; the distribution of the lands and booty was the result of a more or less faithful application of the pacts formalised to constitute the *militia* and imposed conditions of permanence on the recipients of the goods. Colonisation, already contemplated in the clauses of the pacts, involved the settlement of Christian emigrants who replaced the defeated.

The control of the conquered space implicitly entailed the redistribution of cities and rural areas, and was based on three criteria: firstly, to attend to the commitments agreed between the allies, the distribution of components to the respective hosts and the reward or reparation of their financial contributions; secondly, the endowments to the Church, associated with the organisation of the respective bishoprics (Tortosa and Lleida), as agreed with the ecclesiastical authorities; and lastly, the concessions of land to attract settlers to lay the foundations for colonisation (Virgili 2007).

The 12th-century conquests did not generate a specific written record in the form of a codex, as was the case in the Balearic Islands and Valencia. The surviving documentation offers clues to the main lines of the execution of the process, the procedures used and their results. Strictly speaking, the management of the indigenous people and the distribution of houses, lands and rents in the 12th century were the first test of an occupation process that was later refined, albeit following similar criteria.

First, the distribution was carried out among the major landowners who had formalised the military alliances: in both Tortosa and Lleida, Ramon Berenguer IV reserved two-thirds of the city and the territory for himself. The remaining third corresponded to the Republic of Genoa in Tortosa and to the Count of Urgell in Lleida. From then on, each one proceeded to allocate property in accordance with their commitments. Ramon Berenguer IV made important concessions from his portion to the military orders, especially the Temple, endowed the church for the initial organisation of



the new episcopal seats and generously gifted the Cistercian monasteries of Poblet and Santes Creus. With the rest he compensated the barons, urban *militia* and knights who had joined the army and taken part in the sieges (Virgili 2007).

The *repartiment* of Tortosa and Lleida followed a very similar pattern. In the most peripheral and distant areas of the respective cities, homogeneous territorial entities were constituted and designated differently according to their location and according to how they had been previously defined: *castra*, *almunia*, *turres* in Lleida (Eritja 1998) or *villae* and *castra* in Tortosa (Virgili 2007). These districts were allocated in their entirety to members of the aristocracy, or to various ecclesiastical offices or institutions.

The cities and their immediate surroundings, consisting of the alluvial plains adjacent to the Segre for Lleida and the Ebro for Tortosa, were divided up on the basis of territorial entities called *honores*. An *honor* generally consisted of a house in the town and a farm made up of several scattered plots of land, usually far from each other. It is possible that the composition of these *honores* allowed for different types of land use, such as cereal fields, pastures, orchards, vineyards, olive groves, etc. The recipients of the *honores* were usually members of the lower strata of the feudal hierarchy who had taken part in military operations. The granting of the *honor* constitutes the archetypal document of the *repartiment* and lays the foundations for the most complex and decisive process of the conquest, that of colonisation, since one of the conditions imposed on the recipients was precisely to be *stator et habitator*, inhabitant in the city or its district, therefore, to remain in the occupied territory (Virgili 2007).

Both Tortosa and Lleida and the respective regions became centres of attraction for hundreds of families from different regions, mostly Catalan, but also from Occitania and Aragón. And in Tortosa, Italians and Normans are documented because of their participation in the *militia* (Virgili 2010). The impact of the conquest on the existing Andalusi population, which was partially or totally replaced by the new Christian settlers, is therefore a very important question. The arrival of colonists was indispensable to fill the indigenous population vacuum caused by the conquest. Therefore, a process of population replacement took place and led to the destruction of the defeated society and the construction of a feudal society.

It can be argued that because of the capitulation and the offer of apparently beneficial conditions for the defeated, the conquerors sought to keep most of them in the territory. And some historiographical arguments based on the capitulation and the conditions it provided for the *mudéjars*<sup>2</sup> support that they chose to remain in the conquered regions for the most part. In fact, all the evidence shows the opposite, that they were, in fact, a minority (Virgili 2019a).

Firstly, the capture of Madīna Ṭurṭūša was a very quick operation, lasting only a few days. What slowed down the

final occupation was the siege of the *suda*, and it seems that this was also the case in Madīna Lārida. In both cities, most of the population was soon affected by the attack, and it was more than five months before the capitulation was signed. Meanwhile people fleeing and significant casualties would likely occur during the fighting. Furthermore, later documentation also shows the existence of captives taken as a result of the conquest.

Secondly, the granting of assets (houses and lands) of the *repartiment* implies the prior dispossession of the Andalusi people or, at least, the absence of the former possessors. In any case, the documents of the *repartiment* constitute the written record of the extent of the population's decimation.

Thirdly, the documentation generated by the conquest reveals only a few testimonies of a surviving Andalusi population, and they remained very localised in the towns located on the banks of the Ebro and the Segre, between Lleida and Tortosa. The geographical concentration of the *mudéjar* population often leads to a misinterpretation of their size. In the whole territory they were in the minority. The scarce Muslim population that remained in the two large cities of Tortosa and Lleida was forced to leave the urban centre and settle in a specific neighbourhood (*moreria*) and became a residual population group.

Both the distribution and the magnitudes are consistent with the data provided by the *fogatges* of the end of the 15th century.<sup>3</sup> This correlation cannot be the result of chance, nor is the concentration of the *mudéjar* population in certain towns, which could be the effect of a deportation or resettlement process. There were no *mudéjar* people in most of the conquered territory and, consequently, the groups existing in the Segre and Ebro valleys were a minority and declining as new contingents of the Christian population, attracted by the granting of charters, arrived, and settled during the last decades of the 12th century and throughout the 13th century.

A process of population supplanting had undoubtedly taken place: the large contingents of Christian settlers, whose names are found by the hundreds in documentary sources, are tangible proof of the replacement of the indigenous population. The documents reflect the organisation of the feudalisation process that the conquest set in motion through the formation and consolidation of feudal lordships and the settlement of Christian colonists, while the indigenous population became residual and reduced to segregated groups. The conquest was then irreversible. The new feudal society brought about decisive changes that would lead to the construction of a new rural landscape in accordance with the generation of income. Transformations took place in land use, crops were replaced, the area cultivated with vines and cereals was extended, and other forms of livestock management were applied (Kirchner and Virgili 2018; Torró 2019; Virgili 2019b, 2020). All these changes were an integral part of the conquest and reflected the extent of the societal rupture that it caused.

## Conclusion

The archaeological identification of the Islamic conquest and the earliest settlement processes is particularly difficult to establish in the upper frontier and in its easternmost area. The difficulty in finding archaeological evidence of the Islamic conquest and the establishment of settlements affects not only the regions where the Carolingian conquests took place early on, such as Barcelona and Girona, but also in the area of the upper frontier that stabilised from the 9th century onwards, in the territories of Lleida, Tarragona and Tortosa. In this respect, the lack of knowledge of pottery production and architecture from the 8th century makes the problem more complex. And without these two types of material remains, scholarly attempts to understand the process of Islamic conquest and occupation have had to rely on Arab or Carolingian chronicles and toponymy. This archaeological reality is quite common in al-Andalus, where the material evidence of the conquest is mainly funerary, numismatic and epigraphic (Ortega 2018). The production of ceramics and buildings with distinct technical and stylistic features are identified mainly from the 9th century onwards, or else vague dates are proposed between the 8th and 9th centuries.

The towns at the eastern end of the upper frontier begin to have significant visibility in Arabic chronological texts from the end of the 9th century, when the first references to fortification-oriented construction activities are documented. In the upper frontier, the *muwalladūn* lineages played an important role in the fortification of the cities and the *ḥuṣūn* of the Segre and Cinca rivers. Xavier Ballestín pointed out that the political action of the *muwalladūn* groups on the frontier was no different from that of Arab and Berber groups in the context of the *fitna*. The common aim was to prevent the authority of the Banū Marwān, established in al-Andalus by the *amīr* ‘Abd al-Raḥmān ad-Dāḥil, from interfering with their autonomy and domains (Ballestín 1999, 62). Despite the recurrent breaks with Córdoba’s authority, there was an underlying purpose, that of having their power sanctioned by the *amīr*, with appointments as governors of the leaders of these groups and, by becoming agents of authority, imposing themselves on rival clans. The pacts between these chiefs and the *amīr* of Córdoba consisted of concessions determining how tax revenues were to be distributed, a procedure that had a clear purpose of integration into the state. However, the collection procedures derived from these pacts are unknown and the agreements could be unequal and subject to variations. The inhabitants of Madīna Ṭurtūša, for example, were able to renegotiate a past agreement and obtain significant tax exemptions after complaining to ‘Abd al-Raḥmān An-Nāṣir in AD 941 (Retamero 1999, 97–100).

In the cities of Lleida, Balaguer and Tortosa, no clear records prior to the 10th century have been found so far. Ceramic productions have been identified that can probably

be dated to the 9th century, but they have not yet been properly studied. And some defensive constructions, such as the walls of Pla d’Almatà and some towers in the region of Lleida, have been dated to the 8th and 9th centuries, on the basis of construction techniques and some textual references. The few absolute dates do not allow us to go back further than the very end of the 8th century or into the 9th century. In any case, the little architectural evidence that survives is mostly urban or defensive.

There is a lack of in-depth studies of the architectural techniques of the *ḥuṣūn*. Jesús Brufal has pointed out that the towers identified around Lleida or Balaguer are built with techniques that seem to imitate the layout of ashlar in headers and stretchers, typically associated with the Caliphate, but with much more irregular arrangements, often with less horizontal rows and with less careful forms of stone carving. These characteristics would be due, according to Brufal, to local forms of construction, carried out by stonemasons different from those who undertook urban works or in fortifications clearly associated with the state, such as the *sudda* of Balaguer (Brufal 2018).

The archaeological recognition of the earliest Andalusi rural settlement will depend on the research carried out in settlements from the Visigothic period that may have survived, as has begun to be achieved in Aragón or in Àger (Sénac 2012, 197–198; Laliena and Ortega 2005; Laliena *et al.* 2007; Brufal and Porcheddu 2014, 2015). The few Andalusi rural settlements excavated, such as Zafranales and Tossal de Solibernat, have been interpreted as *almunias* linked to armies because of the findings of weapons and objects related to military panoply (Montón 1997; Rovira *et al.* 1997; Laliena and Ortega 2018). However, the structures that make up these settlements are typical of small rural villages, such as those described by Al-Ḥimyarī, who highlights the defensive resources of peasant settlements.

The feudal conquest of this territory was led by the counties of Barcelona and Urgell. It was in the 11th century that the first military initiatives with the clear aims of conquest and occupation took place, which took place within the broader expansion of Latin Christendom. The conquest of the territory of the valley of the river Segre, to the north of the city of Balaguer, from the first decades of the 11th century was promoted by the Counts of Urgell and Barcelona. The city of Balaguer finally fell in 1105. The distribution of the conquered territory was based on the creation of castral districts and, for Balaguer, a division of the city between the barons involved in the army and the bishopric of Urgell was established. The last effort to conquer the easternmost region of the upper frontier was the campaigns of Tortosa and Lleida, in 1248 and 1249. The conquest of these cities facilitated the control of the adjacent regions. Immediately afterwards the distribution of lands and cities began, alongside the encouraged migration of Christian settlers to

occupy and inhabit those areas from where Andalusí people had been expelled. The management of the indigenous population, the territorial and jurisdictional division between the participants in the conquest, the migration of Christian peasants and the colonisation of the annexed territory were inter-related aspects of a unique process that guaranteed the success of the conquest.

### Notes

- 1 The term *repartiment* (*repartimiento* in Spanish) became a widely used concept in written documents of the conquest and colonisation processes from the 13th century onwards. It refers to the division and granting of the conquered lands and towns to the conquest's participants (Guinot and Torró 2007).
- 2 *Mudéjars* (*mudéjar* in Catalan, *mudéjar* in Spanish) were Muslims who remained after the Christian conquests. We use the Catalan terms (also Catalan *moreria* instead of Spanish *morería*; *repartiment*) because the region under study falls within Catalonia.
- 3 The *fogatge* (Cat) was a direct tax created in the mid-14th century that generated the first written records allowing a quantitative approximation of the population.

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## **PART 3: OCCITANIA**



## Sites in Occitania: The historical and archaeological context

*Carole Puig, David Maso, Margot Hoffelt,  
Jean-Michel Carozza and Aleksander Pluskowski*

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This chapter introduces the historical background and contextual data for the archaeological and environmental sites in the case study areas in Occitania (Occitanie, France), and provides an outline of their chronology. The historical and archaeological contexts for sites in the departments of Aude, Pyrénées-Orientales and Ariège which are referred to in the following chapters are outlined here.

### Geography

Since 2016, the departments of Aude, Pyrénées-Orientales and Ariège have made up the south-eastern part of the modern administrative region of Occitania, broadly corresponding to the southern territories of the medieval county of Toulouse and its vassal polities. This included a large portion of the historical region known as Occitania in Latin and Languedoc in French. The distinctive topography of the region has long shaped its settlement patterns and related economic activities. The eastern part is defined by the broad, fertile plain of Roussillon which is centred on Perpignan. Its coastal Mediterranean landscape is characterised by sandy beaches, lagoons and wetlands. In the south, west and north, the plain is bounded by the Pyrenees mountains and their foothills, with the highest peaks reaching over 3000m. The Agly, Têt and Tech rivers flow down from the Pyrenees and dissect the plain, before draining into the sea. The valleys carved out by these rivers have served as the region's principal communication routes, with the main pass through the eastern Pyrenees located at the Col du Perthus, south of Perpignan. At the western end of the study area, the mountain pass at Col du Puymorens connects the Ariège department in France (historically part of the County of Foix) with the Cerdanya region in Spain (Fig. 12.1).

The Pyrenean foothills are defined by a number of smaller mountain ranges, separated from the higher mountains by valleys. In the eastern part of the region the most important is

the Corbières Massif, which is separated from the Pyrenees to the south by the Agly river and bordered to the west and north by the Aude. The regional centre of Carcassonne is located in the fertile Aude Plain, which separates the Corbières from the Montagne Noire, the south-western tip of the Massif Central. To the north-east, the adjacent Plain of Languedoc (or Narbonnaise Plain) stretches to Montpellier. To the west of the Corbières, the Pyrenean foothills are cut by the Ariège, which joins the Garonne some 40km south of Toulouse.

The topography of the region reflects a complex interplay of tectonic, volcanic and erosional processes, resulting in a diverse range of rock types. Periods of uplift have exposed older rock formations at the surface, while erosion has resulted in valleys, gorges and escarpments. Granite formations define parts of the Pyrenean mountain range, whilst the most prominent sedimentary rock is limestone. This has led to the formation of karst landscapes, characterised by caves, sinkholes and limestone pavements. A portion of the case study area (Vallserra-Les Angles) lies within the Regional Natural Park of the Catalan Pyrenees (Parc Naturel Régional des Pyrénées Catalanes), which encompasses mountainous terrain and alpine meadows. Historically, the Pyrenees, their foothills and the southern stretches of the Massif Central have been an important source of iron ore, which has been extensively mined (Catafau 2005).

### Historical background

The Carolingian lordships of the Spanish March straddled the Pyrenees and gradually transformed into independent polities that followed divergent trajectories. By the end of the 12th century, the political landscape on the northern side of the eastern Pyrenees was dominated by the County of Toulouse, the County of Foix and the viscounties of Carcassonne, Narbonne, Béziers and Albi (Debax 2003,



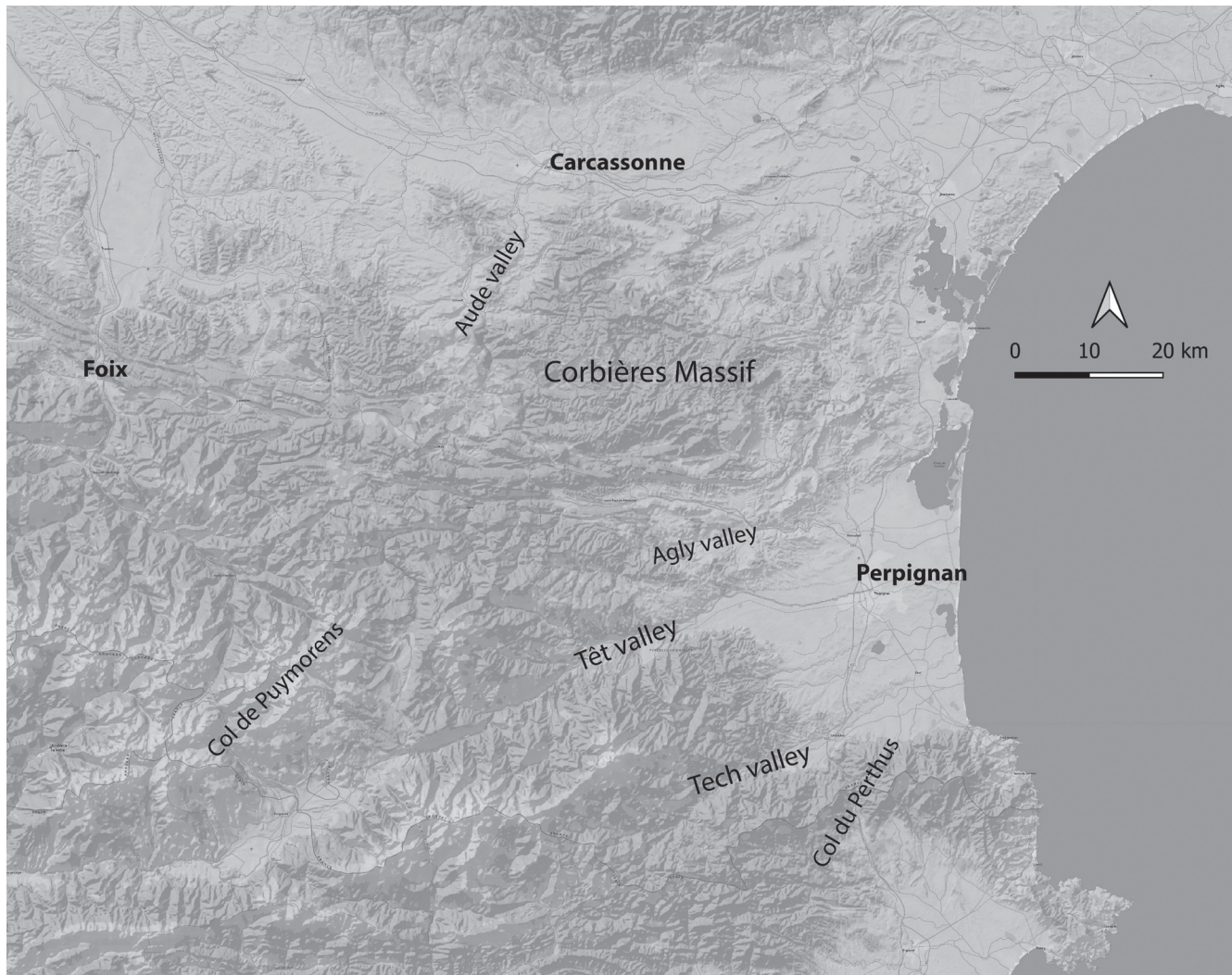


Fig. 12.1. Topographic map of the eastern Pyrenees

2008; Guillot 2005) (Fig. 12.2). The rulers of these larger territories had varied and complex relationships with smaller lordships which emerged at this time, such as Fenouillet, Alion and Cabaret, in what is widely referred to in the scholarship as the ‘feudal period’. They also came under the spheres of influence of neighbouring major powers. The rulers of the Crown of Aragón exerted variable control over these lordships, including over all of the major Occitan counties at one time or another. To the north, French monarchs were also able to extract oaths of vassalage from some of the Pyrenean lords. The proliferation of religious heterodoxy, particularly dualism – defined as heresy by the Catholic Church – and in later scholarship as Catharism, was a distinctive feature of 12th–14th century Occitan culture. However, the exact nature of religious beliefs and practices in this region, and how much was constructed in the minds of inquisitors, remains debated (Schulevitz 2019).

The political impact of the Albigensian Crusade saw the eventual imposition of French overlordship over the Viscounty of Carcassonne, Béziers and Albi and the County of Toulouse (Fig. 12.3). In 1247, Carcassonne was officially incorporated into the French kingdom and Toulouse followed suit in 1271. The immediate and long-term aftermath of the Crusade saw the reconfiguration of the political landscape, where royal power was delegated to a small group of French aristocratic families and officials. They were granted the properties of disenfranchised Occitan nobles (also referred to as *Faidit*) and rebuilt them as centres of authority representing the new regime. With the establishment of the French-Aragonese border in 1258, both the Capetian and Aragonese kings invested in strategic fortifications in the Pyrenees.

The County of Foix was largely unaffected by the Crusade. Its rulers, accumulating wealth from confiscating smaller lordships, also invested in fortifying and

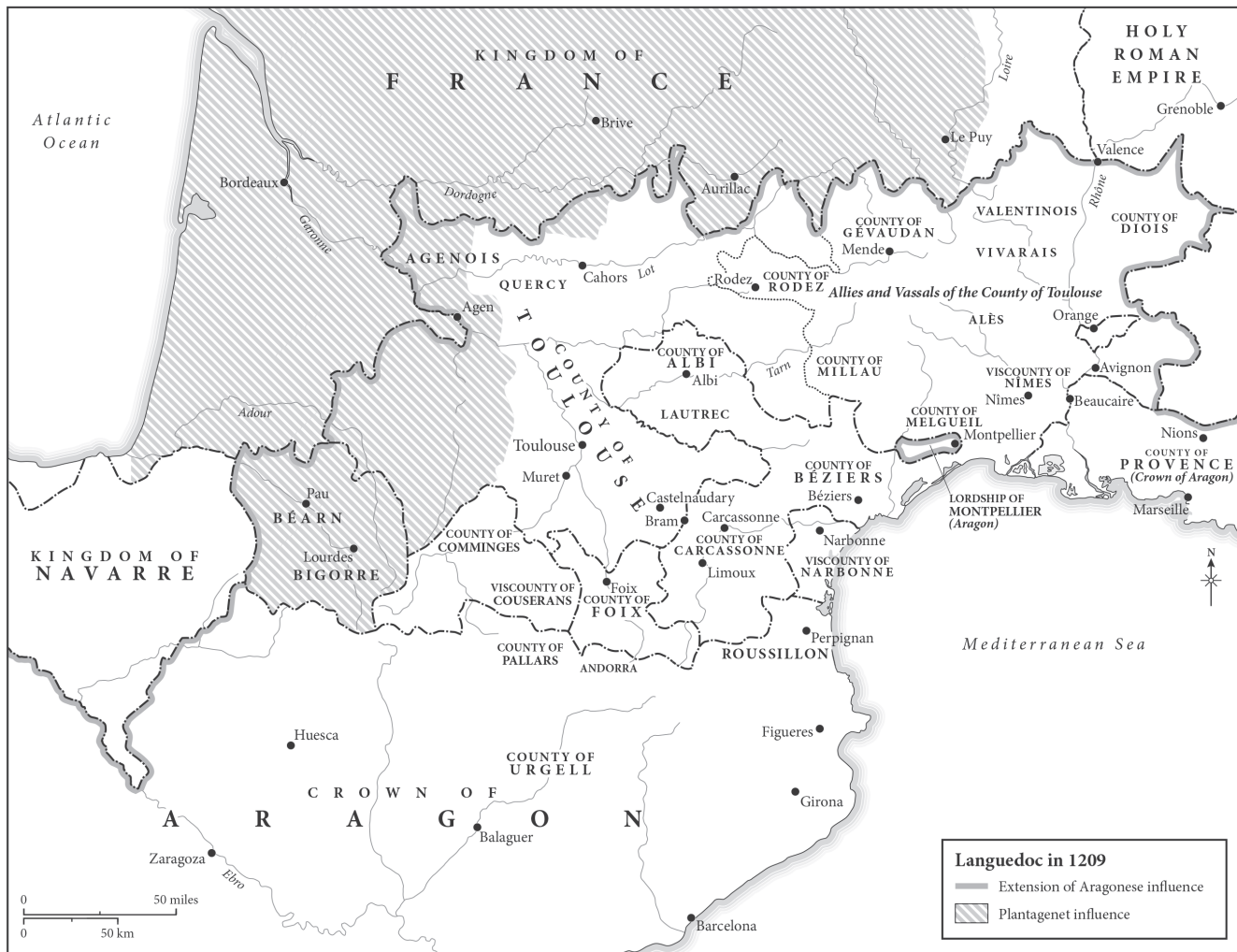


Fig. 12.2. Territories in the eastern Pyrenees in the early 13th century

encouraging the populating of their frontiers. Nonetheless, French suzerainty was recognised by Roger Bernat over the north of the county in 1263, and then over the Sabartes in 1277. As a result, a number of the county's fortifications were abandoned, although the persistence of some sites such as Montréal-de-Sos can be connected to their valued economic role, in this case in relation to the Rancie iron mine which was expanding with increasing demand for ore (Verna 1994). By the end of the 13th century, the rulers of Narbonne were also functionally vassals of the French crown, although the viscounty would not be merged with the kingdom until 1507.

The consolidation of French rule in the eastern Pyrenees, aided by the activities of inquisitors, was accompanied by a reduction in Aragonese influence in Occitania. Nonetheless, this continued in the County of Roussillon which had been controlled by Aragón since 1172, and subsequently incorporated into the Kingdom of Majorca along with the territories of Cerdanya and Conflent. This had been created as a buffer

state by James I and had the status of a vassal of Aragón from 1279 to 1349, after which it was reincorporated into the Crown of Aragón (Zimmermann 2005). The political delineation of the border continued to fluctuate, associated with various conflicts. In 1659 the Treaty of the Pyrenees was signed, resulting in significant territorial changes (Fig. 12.4). In the south, France gained Roussillon and a part of Cerdanya (excluding Llívia which became a Spanish exclave), and a new border was delineated which was further confirmed in the 18th and 19th centuries. The intellectual support for this redefinition was rooted in contemporary understandings of the ancient division between Gaul and Roman Iberia (Leveau and Palet Martinez 2010).

### Archaeological sites

Sites dating to the medieval period in south-eastern Occitania consist of urban centres, often with Roman origins (e.g. Elne, Carcassonne) as well as the planned bastides of



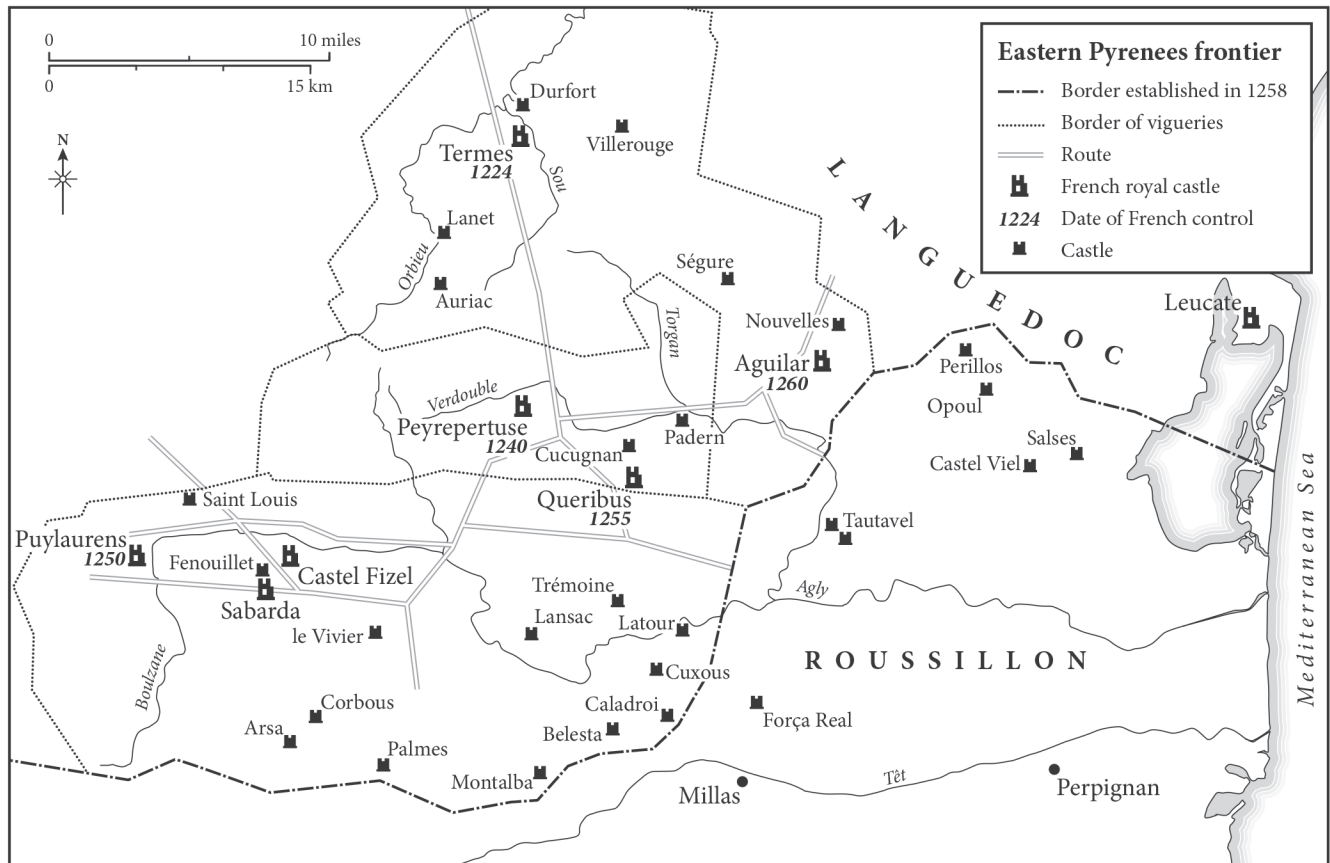


Fig. 12.3. Territorial subdivisions between Languedoc and Roussillon following French annexation of eastern Occitan lands

the 13th and 14th centuries, rural settlements (e.g. Berthe and Cursente 2001; Abbé 2003; Baudreu 2004), churches, monasteries (e.g. Parodi 1994) and fortifications. The latter category, which includes castral villages (Colin *et al.* 1996) that proliferated in the Pyrenean foothills in the 12th century and fortified churches (Crozier 2004, 2007), has attracted the most scholarly attention (for a recent overview see Barrère and Faravel 2006). Regional castle studies have focused on the fortified structures (and in some cases associated settlement patterns) in the Corbières (Dieltiens 1997, 2014; Bayrou 2004, 2019a), the County of Foix (Guillot 2005), the Pays de Sault (Sarret 1985), the Albères region (Constant 1999) and the broader Pyrenean territory of the Kingdom of Mallorca (Puig and Bayrou 2023; see also Salch *et al.* 2004). The varied shape and size of these castles reflect a range of factors, including levels of investment relating to their importance and the ambitions of their owners, and the use and influence of local geomorphology (e.g. Bayrou 1988). A number have been surveyed, some have been extensively excavated, but many remain poorly known archaeologically. The most intensively researched have been the frontier castles established by the French crown, the so-called ‘five sons of Carcassonne’ (Aguilar,

Peyrepertuse, Quéribus, Termes and Puylaurens) which are referred to as such from 1483.

In terms of the cultural landscape, there have been a number of interdisciplinary studies focusing on agriculture (e.g. Puig 2003; Durand 2004), viticulture (e.g. Boissinot and Puig 2006; Bille 2007; Ros and Vaschalde 2021), pasture and transhumance (e.g. Davaresse *et al.* 1997; Rendu 2003; Conesa 2006), mining and forging (e.g. Izard 1994; Ambert 1999; Bailly-Maître and Gardel 1999) and wetlands (e.g. Abbé 2005). The cultural impact of French rule in Occitania has also been explored from different material perspectives. Alongside the impact on existing fortified structures (Cazes *et al.* 2004) and architectural introductions, French influence is also reflected in coinage (Bompaire 2002), whilst Catalan/Iberian ceramics and metalwork continue to circulate more widely in the region (Leenhardt 1995).

Sites were selected in relation to their proximity to the historical frontier, their significance during the feudal and royal periods, and the availability and accessibility of material. For reasons beyond our control, it was not possible to conduct new excavations at any of the sites within this case study region. Instead, analyses focused on archival archaeological and historical data (Aguilar, Peyrepertuse, Termes,





Fig. 12.4. A map by Nicolas Sanson, most likely c. 1694, showing the border between France and Spain established by the Treaty of the Pyrenees (Institut Cartografic de Catalunya, Wikimedia Commons)

Fenouillet, Sabarda, Castel Fizel, Vallsera, Les Angles, Opoul), on the study of faunal assemblages (Peyrepertuse, Termes, Fenouillet, Montailou) and pollen cores (Vallsera). Plant macrofossils were published from earlier excavations at Les Angles (Bergeret 2002), although the recovered faunal assemblage was unfortunately not accessible. Within the context of the Occitan case study area, all are defined as primary sites (Fig. 12.5).

### Primary sites: Aude

#### *Aguilar*

In the early medieval period, several ecclesiastical centres were established in the vicinity of the later castle of Aguilar: the abbey of Lagrasse, founded at the end of the 8th century, Saint-Polycarpe, founded in the 8th–9th centuries, and Cubières-sur-Cinoble, founded in the 9th century. Lagrasse soon became the dominant landowner, although Catalan aristocrats and settlers retained many other properties such as Villare Monte-Auriolo, Villa Ederas, Villare Donnas, Villa Manazeto and, in particular, Villa Liciniano (Teres 2005). At the same time, the counts of Besalù acquired land between the Viscounty of Narbonne and the

counties of Razès, Roussillon and Fenollède. The feudal system was gradually established in the region, although the number of aristocratic families involved in this process remained quite small. It was in this context that the *castrum* of Aguilar was founded. Its first clear mention dates to 1020 in the will of Bernard Taillefer, Count of Besalù, which referred to the northern limit of his landed possessions as being marked by the ‘*puio que dicunt Agilar*’ (Mahul 1863, 602–604). Etymologically, however, there is nothing to suggest that the castle was already in place, since ‘*puio*’ refers to the toponyms ‘*pogium*’, ‘*montes*’ or ‘*rocha*’ which do not necessarily imply fortifications (Constant 1997, 447–449).

In the 12th century, the growing power of the Termes family allowed it to establish itself as the antithesis of clerical power, and in particular of the Abbey of Lagrasse. The castle at Aguilar was built in a strategic location overlooking the Tuchan-Paziols valley following the principle of ‘*incastellamento*’ (Teres 2005, 432). Courrent (1903, 119–132) interpreted the peripheral wall, still visible below the later royal fortification, as an early defensive feature of the castle. However, several traces of buildings have been detected between the two structures (Teres 2005, 397),





Fig. 12.5. Map showing the location of sites in south-eastern France included within this study

which suggests these are the remains of the early village most likely established at the time of the Termes family. In 1241, following the surrender of the *Faidit* Olivier de Termes, the castle appears to have been placed under royal authority, since the eldest of the Trinouillis brothers, who belonged to the Carcassonne garrison, became Aguilar's castellan (Broquet and Villanueva 2017, 17). This is the first time that the site is mentioned as a '*castrum*' (Teres 2005, 417).

In 1250, in recognition of Olivier de Termes' service in the Holy Land, Louis IX returned the castle to him. Ten years later, a deed of sale was concluded between Olivier and the royal administration (Broquet and Villanueva 2017, 17), and the castle then became part of the French defensive line of the frontier (Bayrou 2019a, 125). Following this acquisition, the village established on the *pech* (hill) was not destroyed: at the beginning of the 14th century, several documents mention houses located there (Teres 2005, 418). Aguilar is the only castle in the Corbières where the persistence of the village associated with the feudal period is evident following its acquisition by the French crown.

This provides an unusual opportunity for studying the coexistence between the village and the royal garrison. In 1543, the castle was occupied by German mercenaries sent by the Spanish crown (Courrent 1903, 116), before being returned to the Kingdom of France. In 1597, repairs were requested by the government of Languedoc on the castles of Peyrepertuse, Puylaurens, Quéribus and Termes, but excluded Aguilar, suggesting that it was already abandoned by this time (Bayrou 2004, 47).

#### *Architecture and archaeology*

The castle stands on a hill reaching 300m.a.s.l. which is made up of yellowish marly limestone dating from the Lower Bedoulian, overlying a reef limestone with dolomitic layers dating from the Upper Valanginian (Broquet *et al.* 2018, 17) (Fig. 12.6). The castle's viewsheds across the surrounding landscape are restricted by the high reliefs of Mount Tauch and the Garrigue Plateau (Broquet *et al.* 2018, 16) (Fig. 12.7). This prompted the introduction of certain architectural features, but did not, however, detract from the strategic value of this location, which had lain within





*Fig. 12.6. Aguilar castle today (© Philippe Benoît, AMPM)*



*Fig. 12.7. Aguilar castle in its broader landscape context looking east, with the sea in the background (Jcb-caz-11, Wikicommons)*



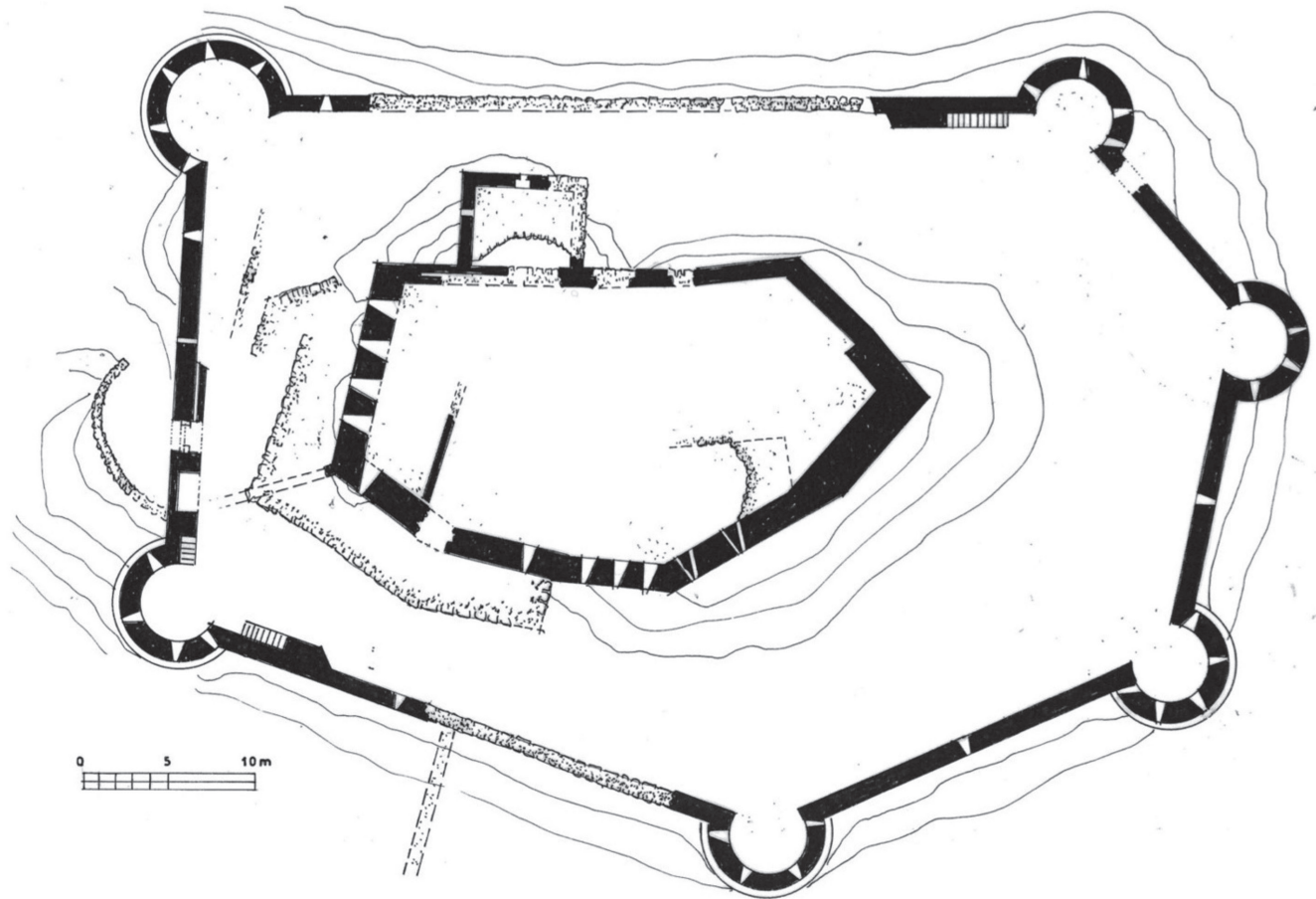


Fig. 12.8. Plan of Aguilar castle (Lucien Bayrou)

a frontier zone for many centuries (Teres 2005, 399). In addition to the fieldwalking surveys carried out by Teres in the early 2000s, several excavations were carried out jointly by SARL ACTER Archéologie and the masonry company 'PY', then by 'Axes-Sites'. This has enabled a more detailed understanding of the complex's diachronic biography (Broquet *et al.* 2018).

The fortified complex is made up of two concentric enclosed wards (Fig. 12.8). The upper ward constitutes the original seigneurial core with the adjacent royal buildings. To the south of the latter the remains of a smaller wall enclose the probable remains of the old *castrum*, with an orthonormal plan (Teres 2005, 433). This small residential area can probably be associated with the chapel still *in situ*, perfectly oriented and located to the west of the barbican of the royal ward. The upper ward has an irregular pentagonal plan conforming to the morphology of the underlying rocky base. Against the northern curtain wall, a rectangular tower was built, commonly identified as the principal residential building with a ground floor occupied by a cistern. The lower ward had a hexagonal plan and contained a number of buildings (Broquet *et al.* 2018, 42). The joints between

its segments are marked by semi-circular towers – the north-west tower being much larger than its counterparts – some of which have a truncated cone-shaped base with bossage (Fig. 12.9). The castle's architecture was not upgraded to defend against artillery, confirming that it was abandoned during the 16th century.

### *Peyrepertuse*

The *pagus* of Petra Pertusense was originally a Carolingian political entity and first appears in written sources from 842, when it was most likely part of the County of Razès (Bayrou 2000). In the 870s, the county shrank, but new settlements continued to be established. In 876, this included Albières, in 908, Padern, Bouisse and Lairière, and in 951 Cucugnan, Lauriol, Mouillet, Perapertusès and Villerouge. In 1111, Perapertusès was integrated into the county of Barcelona, then in 1137, following the marriage of Petronilla, daughter of Ramire II, and Raymond-Bérenger IV of Barcelona, it came within the domain of Aragón (Pous, 1939, 8–11). At the end of the 12th century, Perapertusès came under the control of the Viscounty of Narbonne.



Fig. 12.9. The north-west tower in Aguilar castle (Margot Hoffelt)

The first mention of the castle itself dates to 1020, when it is referred to as *castellos*. It is associated with a family centred on Pierre-Amiel, who were vassals of the Viscount of Narbonne. From the 12th century, the site was described as a *castrum* and associated with a specific territory. During the Albigensian Crusade in 1229, the castle fell to Nunyo Sanche, Count of Roussillon and Cerdanya. In 1239, he sold it to King Louis IX but the French crown did not take possession of it until the following year. After the siege of Carcassonne, the *Faidit* lords withdrew to the Corbières, which led Guillaume de Peyrepertuse to submit to Seneschal Jean de Beaumont and the French king. The castle then became a major stronghold on the frontier and was extensively rebuilt.

#### *Architecture and archaeology*

This emblematic castle and its associated territory have been the subject of extensive research. Anny de Pous (1939, 1962) published two studies on the Perapertusès, providing an initial overview of the fortified sites in this area. Then René Quehen (1975) focused his attention on



Fig. 12.10. Peyrepertuse castle today (© Philippe Benoît, AMPM)

the seigneurie and carried out two archaeological excavations in the immediate outskirts of the castle. Finally, the work of Lucien Bayrou (2000) contributed the most detailed understanding of the castle through annual archaeological investigations carried out between 1977 and 1993 (Fig. 12.10).

Situated within a prominent part of the landscape of old limestone hills, the castle occupies a rugged spur at an altitude of 796m.a.s.l., above the meander of the river (Fig. 12.11). Its location enabled it to control the east/west communication route which links the Mediterranean to Limoux and Quillan, and which was punctuated by fortifications of the same type. To the south, it had control over the routes towards the Fenouillèdes. The feudal-period castle extends over the widest part of the eastern spur, and consists of a quadrangular structure with a circular tower located to the west. In 1115, the church of Sainte-Marie de Peyrepertuse is mentioned for the first time, and was then given to the canons of the priory of Notre-Dame de Serrabone. It is located to the north of the main residential building, and has a single nave originally covered with a barrel vault. Its status as a parish church is clearly defined in the written sources.





Fig. 12.11. View of Peyrepertuse castle from the valley below (H. Zell, Wikimedia Commons)

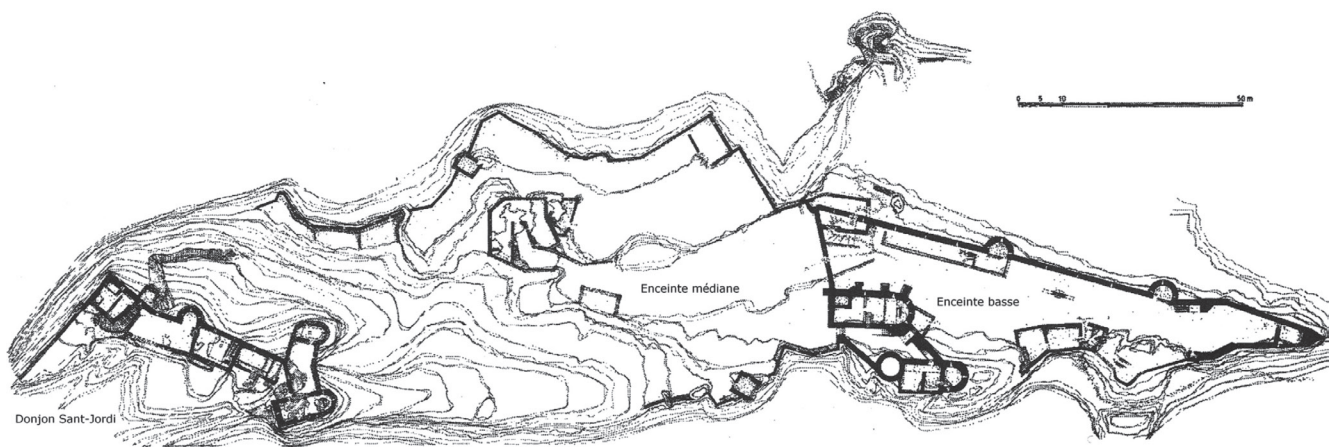


Fig. 12.12. Plan of Peyrepertuse castle (Lucien Bayrou)

Under royal ownership the castle was remodelled (Fig. 12.12). Limestone, quarried on site, was used for the building works, at times augmented with tufa or sandstone. Work began relatively quickly since in 1242 Louis IX ordered that a staircase be built to access the summit above the existing seigneurial fortress, which was retained. The remodelling continued beyond the mid-13th century, and included the renovation of the building in the lower ward, and the enlargement of the fortress with the creation of a new keep – San Jordi (Bayrou 2000). The accounts of the works, dated to 1250–1251, have been preserved (Bonnet 1973).

The San Jordi keep which dominates the summit is composed of several rooms, two cisterns and a semi-circular tower open to the gorge (Fig. 12.13). To the east, a chapel

was partly cut into the rock, taking the form of a single, rectangular nave, divided into three bays by six pilasters and a semi-circular apse. On the western side, the esplanade was closed to the north by a crenellated wall. The lower ward representing the old feudal complex effectively became a small, autonomous fortress. A curtain wall was built on the accessible parts of the spur and furnished with walkways, crenellated parapets and arrow slits. Holes for hoardings are also evident. Between the San Jordi keep and the lower ward, a quadrangular watchtower and a polygonal building were constructed. In this respect following its rebuilding Peyrepertuse became defined by two military centres, linked by an esplanade. Both had a religious building and a cistern, which suggests that they may have been designed to function separately in the event of an attack.





Fig. 12.13. San Jordi keep, Peyrepertuse castle (H. Zell, Wikimedia Commons)

The first settlement associated with the castle was located on the eastern ridge, where the remains of a quadrangular building uncovered in 1980 and associated with several burials was interpreted as a small church or chapel (Quehen 1980). This may reflect occupation of the site prior to the year 1000. Traces of a settlement are also evident on the northern slope dating to the 12th and 13th centuries, which could have borne the name of the castle mentioned in contemporary written sources. However, it did not endure beyond the 13th century and this may have been the result of a deliberate royal decision. This hypothesis remains difficult to verify, especially since the chronology of the site has only been determined from surveys (Baudreu 2010).

### **Termes**

Termes was the centre of the lordship of the Termenès established in the 11th century in the frontier between the lands of the counts of Barcelona and the viscounts of Carcassonne. Within its territory it controlled some 40 villages. By the start of the 13th century, it was one of the largest castles in the Corbières. During the Albigensian Crusade, the lords of Termes sheltered heretics and the castle was besieged

and taken in 1210. In 1226 it became a royal fortress, and Louis sponsored major remodelling works there to integrate it into the line of frontier castles (Fig. 12.14). Following the movement of the border, the castle was destroyed with gunpowder in 1654. It has been the focus of restoration work since 1989.

### *Architecture and archaeology*

Archaeological investigations have been carried out on the site since the 1970s (Bayrou 1975; Chambon 1997; Cazes and Charpentier 2005; Cazes, Maso and Charpentier 2008; Cazes, Crozier and Massendari 2009, Guinaudeau and Cazes 2012; Guinaudeau and Broquet 2015; Guinaudeau 2021) (Figs 12.15, 12.16). The original residence from the feudal period was constructed on top of the spur, and consisted of an enclosed ward with various buildings including a chapel, with a central square keep. Around the castle, a second ward housed residential buildings. On the southern flank lay the castral village, and on the northern end of the spur, a fort called the Termet (described by Pierre des Vaux de Cernay in his account of the siege of 1210) controlled the approach to the castle from the north (Cazes 2009, 2010).

Studies of the curtain wall determined it consisted of two walls built up against each other, with the inner datable to the feudal period. The outer wall is most likely connected to the transformation of the seigneurial castle into a royal fortress, since it uses the architectural elements found at the other royal sites in the Corbières (Bayrou 1990). A survey of the castle chapel carried out in 1992 made it possible to date the building to before 1210, although a northern and eastern door were added during the French remodelling of the fortress in the mid-13th century (Langlois 1993).

During this time, the castle chapel was comprehensively investigated. On a natural substrate with tenuous traces of occupation from the end of the Iron Age, there was evidence for the initial phase of medieval settlement represented by thick layers of mortar, undoubtedly related to a major construction site linked to the origin of the castle. The various levels of occupation associated with it have yielded a range of artefacts dating to the 10th and 11th centuries. Here, the subsequent occupation deposits were levelled during the development of the castle chapel towards the end of the 13th century. Evidence for late medieval occupation is also very ephemeral and most of the archaeological evidence is from the 17th century – the final period of occupation (Cazes 2009).

### **Quéribus**

Quéribus castle is perched on a rocky peak in the Corbières massif, dominating the Plain of Roussillon, the Cucugnan valley, and the Grau de Maury (Fig. 12.17). Probably built at the very end of the 10th century or the beginning of the 11th century, it is first mentioned in 1020 in the will of Bernard Taillefer as a property of the counts of Besalù, who had taken



Fig. 12.14. Termes castle

over a large part of the Perapertusès territory (Bayrou 2019a, 24). It then changed ownership several times along with the rest of the Perapertusès. The *Faidit* Chabert de Barbaira was in possession of the castle when Olivier de Termes seized it in 1255 on the orders of Louis IX. Subsequently, the signing of the Treaty of Corbeil positioned Quéribus as a French frontier stronghold. The castle then became the focus of a major construction campaign. The remodelling of its fortifications did not prevent the Aragonese from seizing the castle two centuries later, in 1473. In 1793, when war was declared between France and Spain, the president of the District Council of Lagrasse requested that several fortresses located on the border be restored ‘to a state of defence’, which included Quéribus (Bayrou 2019b, 134–135). This suggests the castle was probably not completely disused, but following the Battle of Peyrestortes that year, Quéribus was completely abandoned.

#### *Architecture and archaeology*

Unlike the castles of Aguilar or Puylaurens, which incorporated the remains of complexes from the feudal period, there is no archaeological evidence for anything preceding the construction of the royal castle. Quéribus was constructed

on a rocky peak which rises to an altitude of 728m. The peak was flattened and the quarried stone then used for the construction of parts of the complex and in particular for the facings of the cistern located near the barracks (Cazelles 1989, 49). The castle itself is characterised by a compact plan, defined by three enclosures with eclectic morphologies that reflect the constraints of the local topography (Fig. 12.18). They form a set of ‘terraces’ oriented towards the west, and there is masonry evidence that an earlier enclosure was obliterated by these developments (Gau and Gau 1986, 78).

To the north-east of the stronghold defined by the upper enclosed ward, a large keep was built, forming an internal, almost perfect square of c. 7m on each side, and an external, polygonal plan. The massiveness of the walls and the division between the internal and external parts of the structure suggest this was the subject of a large-scale renovation. The lower parts of the keep consist of a storeroom (Gau *et al.* 1989, 85) or cellar (Bayrou 2019b, 133), served by a postern located in the south-west corner, as well as a room with a central pillar and four ribbed vaults (Fig. 12.19). A mullioned and transept window fitted into the southern wall provided lighting for the interior, below which three arrow



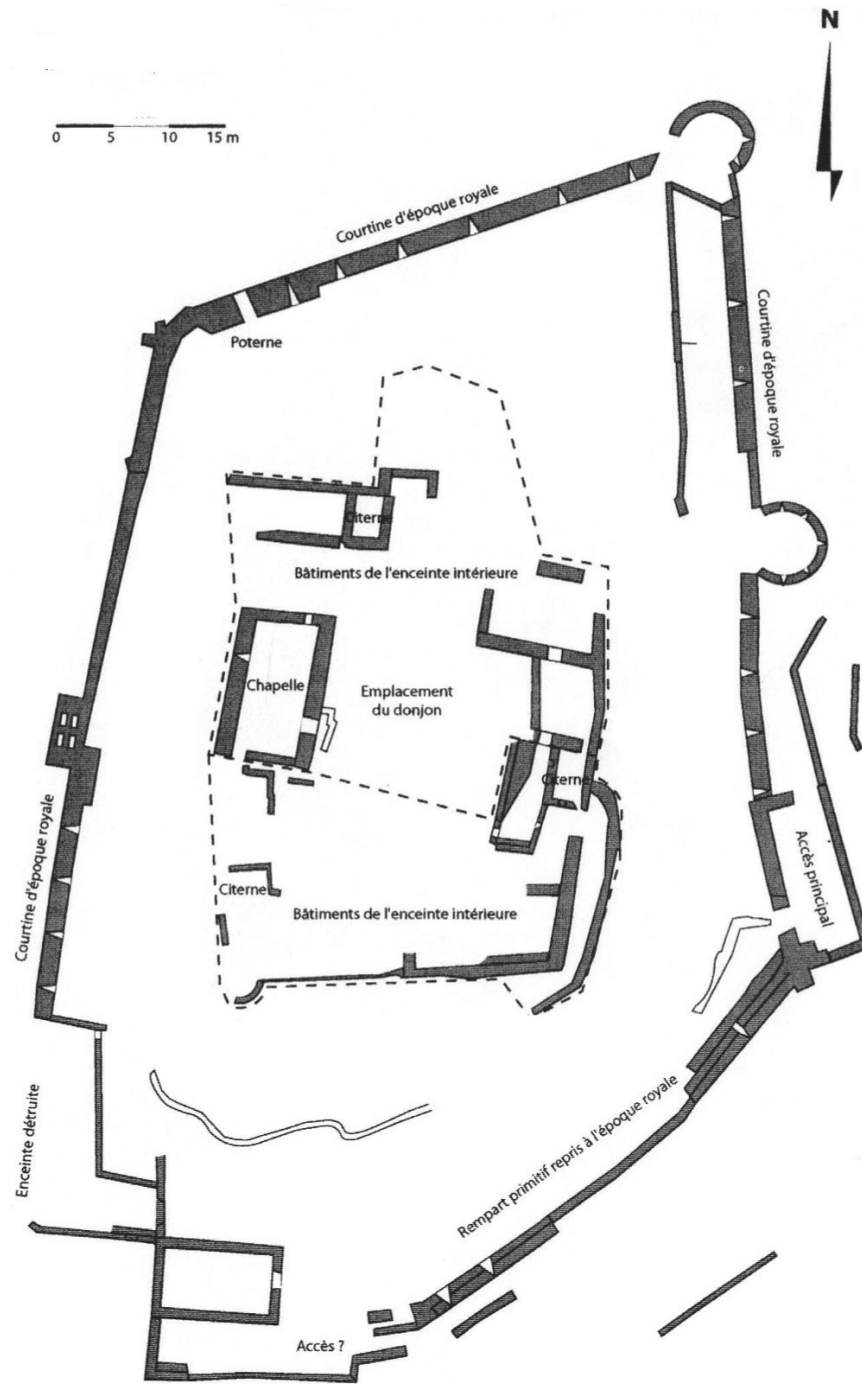


Fig. 12.15. Plan of Termes castle

slits are commonly interpreted as the only remains of the earliest phase of the castle (Bayrou 2019a, 6). To the south of the keep, a triangular building with two barrel-vaulted floors was served by a spiral staircase leading up to the roof, which was later converted into a firing platform. The intermediate ward includes a rectilinear barracks, a cistern half-cut into the rock and a watchtower. Finally, in the lower

ward, a flight of steps connected the castle's main entrance in the north-west to the intermediate ward. The complex was adapted to withstand artillery attacks, and several gun ports were added to the lower ward and planned in the parapet of the summit terrace of the keep.

Excavation campaigns were carried out in 1985, 1986 and 1989. In 1985, three areas were investigated: the 'platform',



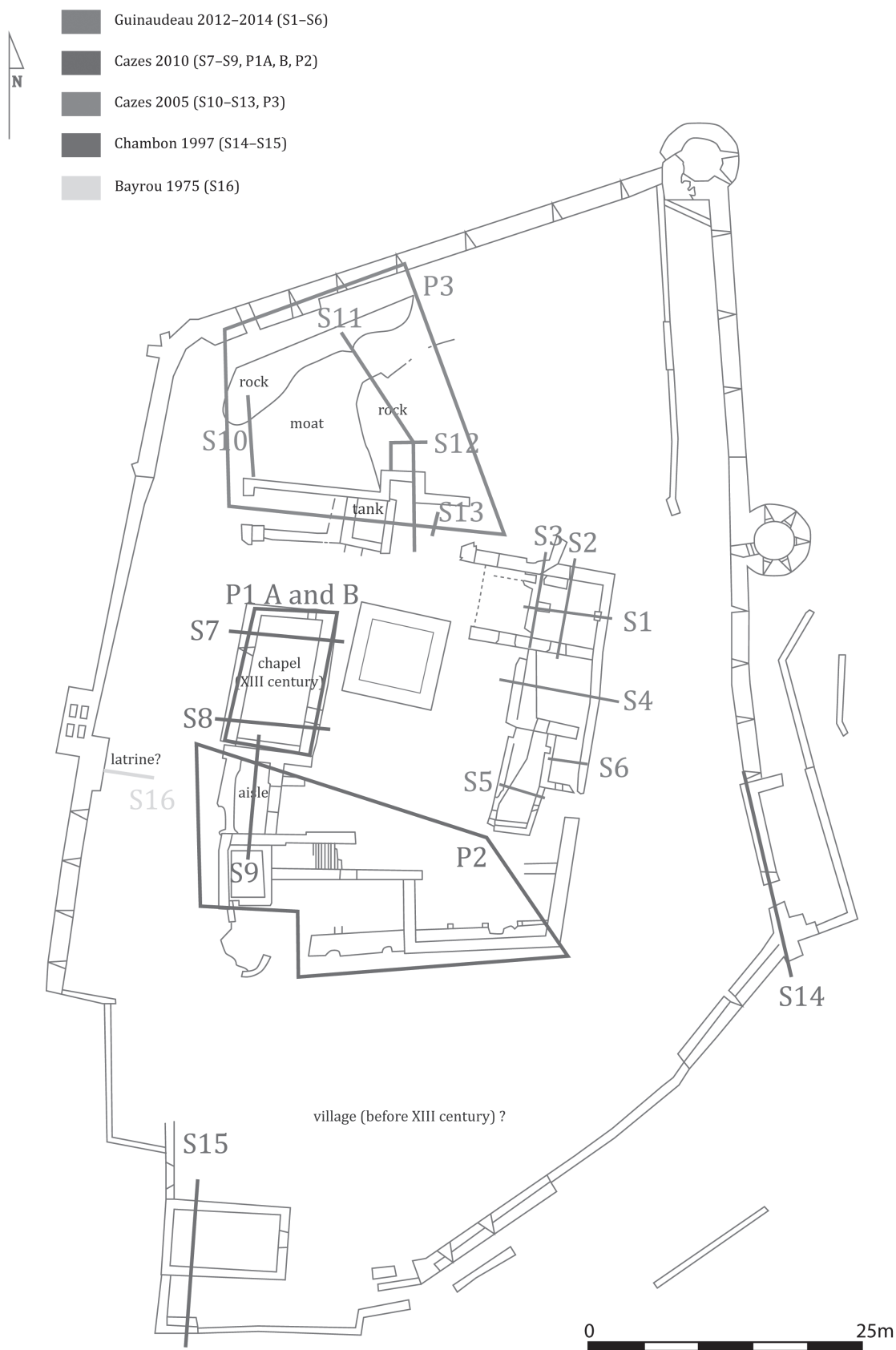


Fig. 12.16. Plan of Termes castle showing the location of excavations



Fig. 12.17. Quéribus castle (BlueBreezeWiki, Wikimedia Commons)

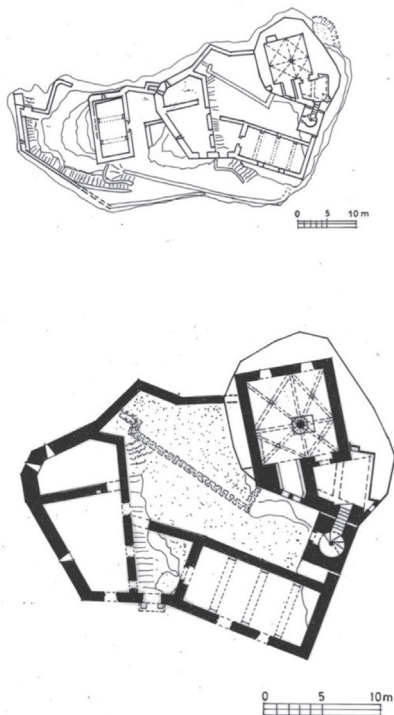


Fig. 12.18. Plan of Quéribus castle (Lucien Bayrou)

located above the access road to the castle, the main building and a dump located on the southern slope of the *pech* (Gau and Gau 1985, 34–39). In 1986, a survey was carried out on a terrace located below the castle which identified traces of occupation dating back to the 13th century (Gau and Gau 1985, 40–42). In 1989, the antechamber of the keep, the barracks and the cistern adjacent to it were investigated, and artefacts found in the cistern confirmed that it was used as a rubbish dump from the 17th century (Gau *et al.* 1989, 79–80). This confirmed the site was gradually abandoned following the signing of the Treaty of the Pyrenees. A thorough archaeological study of the entire complex is still required to understand its origins and developmental chronology, complementing the work carried out by Bayrou (1998).

### **Puylaurens**

The peak on which Puylaurens castle was built, Mont Ardu, is mentioned for the first time in 958 in a charter of Lothair as belonging to Pons, Abbot of Saint-Michel-de-Cuxa (Bayrou 2019a, 7). Overlooking the Boulzane valley, this strategic location facilitated control over the routes leading to the Pyrenees, Sournia, Prades, Conflent, as well as the Plain of Roussillon and the Aude Valley (Bayrou





Fig. 12.19. The central pillar and four ribbed vaults in Quéribus castle's keep (Margot Hoffelt)

2019a, 6). Situated in the territory of the Fenolhédès, the castle came under Aragonese control in 1162. In 1229, the Treaty of Meaux saw this territory transferred to the Kingdom of France. In 1233, Louis IX gave the viscounty of Fenolhédès to Nunyo Sanche, grandson of Peter II, King of Aragón. Upon his death in 1241, Pierre de Fenouillet was granted the fortress, although two years later the Capetians took it back under their control. Ownership must have changed again briefly for in 1258, Hugues de Saissac paid homage to the King of Aragón for the castles of Fenolhédès and in particular for that of Puylaurens (Bayrou 2019a, 9), but in the same year the Treaty of Corbeil officially ceded Fenolhédès and Peyrapertusès to the Kingdom of France.

Falling under the jurisdiction of the Seneschal of Carcassonne, the site became the focus of major renovations that continued until at least 1302 (Bayrou 2019a, 10). In 1355, a new campaign of re-fortifying all the castles located on the border of the Seneschal's territory began (Bayrou 2019a). At the turn of 1393/1394, Charles IV demanded the repair

of the majority of the castles in the Corbières, including that of Puylaurens (Bayrou 2019a, 11). In 1597, it was one of the castles that was singled out for repairs and was only completely abandoned at the beginning of the French Revolution (Barbe *et al.* 2019, 32).

The presence of a village prior to the development of the fortress has been the topic of some debate (Bayrou 2019a, 51). In 1011, according to a papal bull, the territory of Puylaurens had several churches, notably those of Sainte-Croix and Saint-Laurent, which Raynaud (1995, 350–352) suggests understanding as buildings that could have formed the nucleus for the construction of a military complex – ‘*castellum*’ for the first, ‘*castrum*’ for the second. Whether it pre-existed or not, a settlement did indeed function alongside the castle during its first centuries of existence and developed, according to surveys, to the east of the summit of the rocky spur, and on its south-eastern slope (Raynaud 1995, 359). In 1339, a document specifies that the community of Puylaurens must pay a total of 42 *sols tournois* to the King of France in exchange for permission to move the village, which then became attached to a place called ‘la Triballe’ and which corresponds to the founding core of the current commune of Puylaurens (Raynaud 1995, 355–356).

#### *Architecture and archaeology*

The castle is one of the best-preserved examples of military architecture in the Corbières Massif (Fig. 12.20). The peak on which it was built, with an altitude of c. 700m.a.s.l., was partly used as a quarry for the various construction campaigns. The whole complex is made up of two enclosed wards with very irregular plans reflecting the constraints of the local topography (Fig. 12.21). The upper ward, pseudo-triangular in plan, probably incorporated the earlier seigneurial core. It is raised around 10m above the lower ward, with a two-storey horseshoe tower to the west and a two-storey hemispherical tower to the north. On the southern front of this defensive line, access to the stronghold is complicated by the presence of a sunken wall (in the manner of a ‘ha-ha’) (Bayrou 2019a, 27). On the northern front, three vertical conduits built into the enclosure – one of which was converted into latrines at a later date – functioned as ‘murder holes’. Inside, there is a rectangular building which appears to have had residential functions, although not as the main keep, probably because it is a structure entirely rebuilt in the modern era. Between this and the eastern curtain wall of the ward, there was a three-storey building leading to the north tower, evident from the presence of the negatives of joist insertions. Finally, to the west of the castle are the remains of a semi-excavated cistern with a semi-circular vault. The lower ward, in turn, has a pseudo-rectangular plan with two, three-storey towers. The castle was the subject of further adaptations linked to the development





Fig. 12.20. Puylaurens castle today (© Philippe Benoît, AMPM)

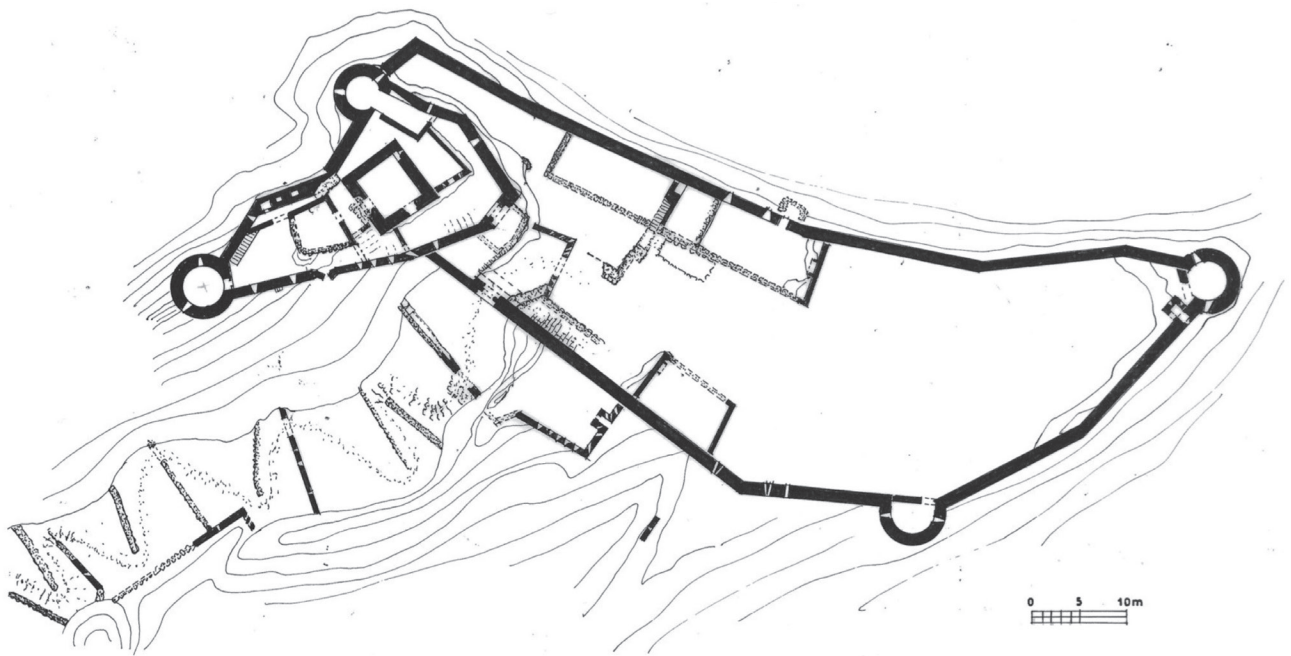


Fig. 12.21. Plan of Puylaurens castle (Lucien Bayrou)

of artillery. Finally, written sources indicate the presence of a castle chapel whose exact location could not be determined. Dedicated to Saint Louis, it could have been erected at the time of the king's canonisation, at the very end of the 13th century. It is only mentioned for the first time in 1554 (Bayrou 2019a, 55).

Between 1992 and 1996, five archaeological investigations were carried out on various parts of the complex (Bayrou *et al.* 1992; Bayrou and Alessandri 1993; Bayrou and Delva 1993; Bayrou and Bouvier 1994; Bayrou *et al.* 1995; Bayrou *et al.* 1996) and after a long pause, two further excavations took place in 2018 and 2021 (Barbe *et al.* 2019, 33–62). Despite these investigations, our knowledge of the origins and morphological development of the castle at Puylaurens remains limited. Data collected during fieldwalking surveys alongside written and toponymic evidence point to the existence of a village prior to the creation of the first fortified structure on Mont Ardu. More tangible archaeological evidence would be needed to confirm this. Whilst it has long been suggested that the castle was entirely rebuilt by the Seneschalty of Carcassonne, observation of the *in situ* remains indicates the preservation of portions of masonry dating to the feudal period.

## Primary sites: Pyrénées-Orientales

### *Fenouillet*

The castle of Saint-Pierre de Fenouillet was the centre of the historical viscounty which is located in the eastern part of the Agly basin. With a contrasting landscape made up of small valleys and low hills, it defines a region which stretches to the Agly in the east, to the limestone cliffs of the Pérapertusès in the north and to mountains rising up to 1500m in the west (Fig. 12.22). This heterogeneous geography constitutes a natural defensive system, although this did not prevent the Fenouillèdes from being controlled by its powerful French or Catalan-Aragonese neighbours throughout the Middle Ages.

The viscounty has attracted the interest of historians for many decades (Pous 1973; Ponsich 1996; Fonquernie 1998; Charpentier 2002; Porcel 2002). It is attested from the year 1000. In 1011, Pope Sergius IV authorised the construction of a monastery at the request of Bernard Taillefer, Count of Besalu, in a place dedicated to Saint-Pierre located in Fenouillèdes. Historiography has associated this mention with the church of Saint-Pierre in the castle (Ponsich 1996). This monastery was endowed from its foundation, with the first abbot, Guadall, adding Saint-Felix, while his brother, Pons, donated his *villa* of Reglles. This act also mentions the church of Saint-André, the parish church of Fenouillet located at the foot of the rock of Sabarda. The castle is first mentioned in the 1020 will of Bernard Taillefer in the form of the *castellum* of Fenolioto.

In the 13th century, Fenouillet came under the control of the counts of Barcelona, and as such was spared by the Albigensian Crusade. But its lord Pierre de Fenouillet was an ally of the counts of Toulouse and Foix, the viscounts of Béziers and Carcassonne, and his support for heretics resulted in the seizure of his property. In 1222, he was dispossessed in favour of Nunyo Sanche, Lord of Roussillon and Cerdanya, who submitted the territory of Fenouillet and Peyrepertuse to the King of France in 1226. But it was not until the Treaty of Meaux in 1229 that Pierre de Fenouillet formally ceded the castle and his lands. After failed attempts to recover his property, he retired to the Templar house of Mas Deu in Roussillon where he died in 1243.

The management of the viscounty seems to have fallen to Chabert de Barbaira, an emblematic figure of the resistance against the French crown. Chabert did not lay down his arms until 1255 following the loss of Quéribus and in 1257, he handed over Fenouillèdes to the king. The Treaty of Corbeil definitively confirmed the transfer of the viscounty into the Capetian domain. Inquisitors subsequently condemned Pierre de Fenouillet – his bones were exhumed and burned in 1262, and his family's estates were confiscated. It was only after this date that the French king seems to have actually taken possession of the castle, which is referred to as a royal fortress in 1272. The viscounty became a *viguerie* dependent on the Seneschalty of Carcassonne. During the first half of the 14th century, the village community of Fenouillet seemed to merge with that of Caudiès, which had become the new local political centre. The castle of Saint-Pierre then disappears from the written record.

### *Architecture and archaeology*

The fortification, built on a spur, covers an area of approximately 1500m<sup>2</sup>. At the top, the castral core is defined by an enclosed ward with a gate tower (Figs 12.23, 12.24). Two other wards parallel to the slope's contours surround the lower part of the fortification, and the associated village developed below this. Several archaeological investigations were carried out between 1994 and 2010 at the site under the direction of David Maso (1995, 1996a, 1996b, 1997, 1998, 1999, 2000a, 2001, 2002, 2004a, 2004b, 2005, 2006, 2007, 2008, 2009). These focused on the eastern half of the complex's core area: the access ramp to the castle, the vaulted room and gate tower, the eastern part of the central terrace and its buildings, the church and the small building attached to it to the north, and finally the summit tower and its immediate surroundings.

There is evidence for protohistoric occupation on the castle hill, along with some material from the 7th and 8th century found in reworked levels. The quarrying of the bedrock prior to the medieval period constructions could explain the absence of earlier structural remains. Based on radiocarbon dating and coins, the castle was constructed





*Fig. 12.22. The landscape directly north of Fenouillet castle*

between the end of the 8th and third quarter of the 9th century, starting with the summit building. The apse of the church could be linked to this period, and under the foundations of the Romanesque building, two Carolingian coins support the hypothesis of a pre-Romanesque origin connected to the site's mention in 1011.

The main tower is located at the highest point of the site. It is rectilinear in plan and built on an east–west axis, following the underlying topography. Its thick walls leave a fairly restricted interior space of 38m<sup>2</sup>. The tower is dated to the second quarter or the middle of the 9th century, and towards the end of the 10th/start of the 11th century, the eastern part of the lower room was used as a rubbish dump. A ditch may have surrounded the building to the north. To the south, the slope was laid out in terraces intended for domestic occupation that was synchronous with the upper castle's construction. In the middle ward, there was evidence for occupation dating to the 10th or 11th century. Given the lack of data, the function of these spaces remains unclear.

In the 12th century, the main tower was developed further. Beaten earth floors were laid on the rubbish dumps, which included large hearths associated with several lime deposits. These continued to be used until the 12th or start of the 13th century, after which they were sealed by a layer of waste that can be dated to no later than the third quarter of the 13th century. The nave of the church was also built during this second phase, with the apse rebuilt at the end of the 12th or in the 13th century. The castle was accessible from the south via a gate tower with three arrow slits, which most probably contained a machicolation. It provided access to a lower courtyard flanked by several buildings, with a large main building to the west. One of these has retained its vaulted room on the ground floor and part of its upper floor. The construction of the gate tower and most of the successive lines of defence testify to the increased militarisation of the castral complex.

When the viscounty passed under the control of the French crown, the castle was deliberately slighted. In the





Fig. 12.23. Fenouillet castle today (© Philippe Benoît, AMPM)

last decade of the 13th century, the summit building was destroyed and its interior space filled. The gate tower lost its defensive character after a stone ramp was built to provide direct access to the interior, and a systematic recovery of building materials is evident. This period also saw the construction of a building which is attached to the north of the church, dating to the last quarter of the 13th or beginning of the 14th century. The dismantling of the fortress continued until the beginning of the 14th century. The Capetian acquisition of Fenouillèdes moved the frontier several kilometres to the south. But the castle of Saint-Pierre was no longer regarded as a major asset by the crown, which instead developed two neighbouring sites: Castel Fizel which dominates the Plain of Fenouillèdes, where royal power is attested from 1260 and to the south, the castle of Sabarda which has better viewsheds over the landscape, noted as a royal fortress from 1290 (Bayrou 1988b). Finally, a tower was built at the northern end of the spur of the castle of Saint-Pierre. It is possible that investment in Puylaurens as a royal fortress also contributed to the abandonment of Fenouillet. The latter then became the principal military centre for the region, with Caudiès assuming the role of administrative centre.

### *The village*

The village of Fenouillet is poorly known. Today it extends around the base of the castle, although beyond its walls. It bears the evocative name of *Villasse*. Evidence for settlement here is indicated for the first time in 1173 in the will of Viscount Arnaud where it is referred to as *barri*. The term could designate the area of the village, thus distinguishing it from the elite settlement that would have developed closer to the castle's core (Baudreu 2004). The document also mentions several localities scattered around the periphery of the site. The first *villa* called ad Ortos was perhaps located to the south-west of the rocky platform, on the banks of the rec de Sant-Jaume. A second *villa*, called Aragnanas, corresponds to the place called Lagnanes located approximately 1.5km south-west of the site. A third, called Cerdan, could be linked to the current Cortal Sarda, on a plateau to the south-east of the castle. Finally, Casas-Novas was perhaps located to the east, on the Fenouillet to Fosse road. In the 1702 land register, only Hortes and Argnanes are mentioned (Charpentier 2002). The medieval settlement of the 12th century is characterised by small, dispersed hamlets whose size is



Fig. 12.24. Plan of Fenouillet castle (David Maso, Sylvain Durand, ACTER)

difficult to estimate. The one that continued to be occupied from the medieval period is located directly under the castle.

### **Sabarda**

The castle of Sabarda lies 300m to the south of Saint-Pierre, and is mentioned in written sources from 1109 (Fig. 12.25). At this time, Guillaume Pierre, Viscount of Fenouillet, paid homage to the Count of Cerdanya for the castle of Fenouillet and the Rocha Samardana. This was a politically difficult period when the viscounty was claimed by both the house of Cerdanya and that of Barcelona. The term '*Rocha*' implies that the occupation could be older. The plan of the building is a square measuring 10 × 10m to which half-open circular towers would have been added to the east and west. Two openings are visible to the north and east, the rock serving as a jamb for the one located to the north.

In 1988, Bayrou carried out an archaeological excavation at the site. He concluded that it was not possible to precisely date its construction, particularly on the eastern side; however, he concluded the west tower was a translation in soft stone of the architectural elements found in the royal fortresses of the Corbières. The radius of this tower is also similar to that of the towers of the San-Jordi keep in

Peyrepertuse which date from the mid-13th century. These various elements suggest the building in its current state is a reconstruction undertaken by the Capetian authority during the establishment of the new frontier after 1258, although it was not until 1290 that Sabarda was referred to as a royal castle. The first mention of a royal garrison here in 1302–1303. A few sources subsequently provide information on the state of its garrisons, the names of certain castellans or the details of material deliveries (Bayrou 1988b). A text dated to 1302 specifies the presence of a carpenter and a stonemason – 'master of the king's works in the seneschal's court of Carcassonne' – at the castle of Sabarda, the houses, prison and mill of Fenouillet (Bayrou 1988a, 2004). Subsequently, only the castle of Sabarda is mentioned in written sources.

### **Castel Fizel**

The castle of Castel Fizel is located less than a kilometre north-west of Saint-Pierre. It is mentioned for the first time in the Treaty of Corbeil in 1258 and constitutes another important strongpoint in the valley, controlling access to the viscount's castle. It consists of a large, somewhat quadrangular enclosed ward accessible by a ramp. A second ward, occupying two-thirds of the south-western area of the previous one, protects a quadrangular tower dominating the





*Fig. 12.25. Sabarda castle, view from Fenouillet castle*

summit plateau. Castel Fizel was destroyed by the Spanish in 1496 (Bayrou 2004).

### ***Vallserra***

The site of Vallserra (municipality of Les Angles) is located in Capcir, a large Pyrenean valley, with altitudes between 1400m and 2800m. Crossed by the Aude which has its source on the slopes of Mont Llaret, the Capcir is organised along a north–south axis which links Conflent and Cerdanya to the Pays de Saut. This corresponds to the medieval frontier between the Crown of Aragón, later the Kingdom of Mallorca, and France. Due to its morphology, this region has historically been an important communication route. Vallserra is located on the northern slope of the valley, at an altitude of 1670m. Set back from the main Capcir route, it lies at the junction of the Lladura and Vallserra valleys. Further down, the Vallserra river crosses a small alluvial and peaty plain (Sanyes) and flows into the Aude. The village is located at the bottom of the Lladura valley, behind a glacial moraine, adjoined by a church and cemetery.

The place is mentioned for the first time in 966, then, more clearly in 1011. It then appears as a possession of the powerful Benedictine abbey of Saint-Michel-de-Cuxa (Conflent) under the form Vallem Ursariam (Bear Valley). This name confirms its remote location and the absence of an eponymous capital suggests a vast territory exploited on

the scale of the entire valley (Brunet 1998). Vallserra then appears in the sources of the 13th century as an organised village community, represented by consuls. In the 14th century, it is documented as having up to fifteen hearths, but by the end of the century the village was abandoned. Bernard d’Armagnac is reported to have pillaged the village in 1389–1390 due to a conflict between his brother and the King of Mallorca. The village livestock were stolen by those who accompanied him. Written sources then reveal that the inhabitants were in debt and forced to leave because of creditors.

But it is also important not to ignore the impact of the plague in the mid-14th century, nor the effects of the Little Ice Age on this remote mountain community. The village seems to have gradually died out from the 15th century, although its organisational structure embodied by the consuls is maintained in the archival documentation. At the very end of the 17th century, the village was deserted and the monks of Saint-Michel-de-Cuxa decided to repopulate it, encouraging seven families to settle the site. A visitation by the Abbot of Cuxa in 1701 reported the houses were ruined, and that the church vault was still intact. However, the resettlement project was eventually abandoned. Although the Vallserra valley naturally opens onto Formiguères, the land was then associated with that of Les Angles, probably because the two communities depended on the same lord, the abbey of Saint-Michel-de-Cuxa.



At the very end of the 17th century, a sawmill was built on the site. This was shortly followed by the construction of a forge, located slightly further south of the village. A fulling mill is indicated on the Napoleonic land register at the beginning of the 19th century. Finally, a lime kiln located to the south of the village most probably operated during this same period.

### *Archaeology*

The study of the Vallsera site is part of a broader programme focused on the deserted villages in the region of Capcir, eastern Cerdanya and upper Conflent. Since 2012, this programme has included archaeological investigations (excavations, fieldwalking surveys etc.) and geomorphological investigations (coring), coordinated by Carole Puig (FRAMESPA-TERRÆ) and Jean-Michel Carozza (LIENss). In 2013, the Vallsera peat bog was the subject of a georadar survey by José Darrozes (GET), and in 2021, of a second geophysical survey by Guillaume Bruniaux

(LIENss). Cores were also taken from the nearby Balcère lake core by Van Campo and Jalut in 1969, Jalut in 1974 and then by Galop in 2015 (Puig, Durand and Carozza 2015; Puig 2016, 2017).

The village of Vallsera extends to the north over approximately 1.5ha between the peat bog and the Lladura (Fig. 12.26). The church of Sainte-Marie, built on a small hillock, is 14m long and approximately 7m wide, built in granite rubble and lime mortar (Fig. 12.27). Its various architectural features suggest its origins can be broadly dated to the 12th century. The associated cemetery, occupying a gentle slope which descends towards the peat bog to the south, is bordered by a dry-stone wall. The residential structures are laid out along the bottom of the south-facing slope, and their remains are visible on the surface. They consist of small housing units composed of several adjoining rooms (Fig. 12.28). Archaeological investigations have dated them from the 13th to the 15th century and, to date, no earlier occupation of the site has been identified. The houses, consisting of



*Fig. 12.26. Ruins of the village of Vallsera*



Fig. 12.27. The ruins of the church of Saint-Marie

one or two rooms, and with south-facing doors, were built of granite rubble bound with earthen mortar on large slabs of schist, which together with a raised floor increased their insulation. The roofs were made of small slabs of schist.

Fieldwalking surveys carried out along the Vallsera valley up to the pond of the same name have demonstrated evidence for historically dense occupation. The remains are varied and probably relate to housing, pastoralism or potentially even fortified elements. However, in the absence of excavations, it is difficult to suggest any chronological sequence. Nonetheless, these observations dovetail with the mention of the Vallem Ursariam from the beginning of the 11th century.

#### *Peat coring*

An electric resistivity survey of the peat bog indicated the presence of three sedimentary layers, with a surface peat level resting on the old lacustrine formations of the moraine lake, with a thickness varying between 1m and 1.5m. This lies on a substrate composed of base moraines located between 1.80m and 2.5m from the ground level. A core sample taken from the peat bog revealed the base consisted of a horizon of grey-blue silt, probably of lacustrine origin, on which a first layer of peat developed. A radiocarbon date of the base of this peat indicated it was formed between 995 and 1150 cal. AD. It is then covered by a detrital level that developed between 1225

and 1290 cal. AD, with a maximum probability around 1270 cal. AD. The latter is covered by a second layer of peat. The development of the peat bog is probably connected with the beginnings of soil erosion on the high slopes and the accumulations of sediment at the bottom of the basin. Moreover, since one of the first mentions of Vallsera is at the start of the 11th century, or even during the 10th century, this may suggest there is a link between the developmental history of the peat bog and the establishment of the village.

The start of detrital activity in the peat bog dating to the 13th century coincides with the beginning of the early wet phase of the Little Ice Age in the Plain of Roussillon (Carozza and Puig 2011; Carozza *et al.* 2011; Carozza *et al.* 2013). This could be the signature of this event in high altitude areas, as has been demonstrated in Spanish Catalonia by palaeobotany (Ejarque *et al.* 2009) and sedimentology (Morellón *et al.* 2010). Here again, written sources attest to the depopulation of the village from the second half of the 14th century and the impoverishment of its remaining inhabitants. While the many crises of the late Middle Ages almost certainly played a major role in the desertion of the site, the changes in its associated natural space may also have had a triggering effect.

Although the site is still being studied and raises many questions, it would seem that a first medieval occupation can be attested from at least the 11th century. It is possible that it





Fig. 12.28. Details of the remnants of dwellings in Vallsera

took the form of small, scattered dwellings which colonised the hillsides of the valley, accompanied by deforestation to make way for cultivated fields and initiating the creation of the peat bog. From the 12th century, the construction of the church of Saint-Marie on a small mound adjacent to the forming peat bog may have had the effect of draining the habitat on its northern periphery. The village then developed like all the other neighbouring communities until it was confronted with insurmountable difficulties. Firstly, the attack by Bernard d'Armagnac confirms that, even though the site is located about 10km from the border, it was very much situated within a frontier landscape. It is difficult to know whether this attack was the cause of the population's indebtedness or whether it aggravated an already difficult situation due to various other factors. However, the observation of detrital events in the second half of the 13th century is reminiscent of the Little Ice Age, whose impact may have been particularly exaggerated for a mountain community located at an altitude of 1650m.

### **Les Angles**

The nearest political centre to Vallsera during its period of occupation was the castle at Les Angles. It is located on a plateau overlooking the valley of the Aude river, on the route that ran north-south connecting Cerdanya and the Corbières. The toponym 'De Angulis' appears for the first time at the end of the 9th century, in a text relating to the

foundation of several churches by the Count of Cerdanya; in the 10th century the urban area of Les Angles became a possession of the Abbey of Saint Michel de Cuixa. The castle was probably built in this period (Vecchione 2000, 6). In 1258, the castle was affirmed as belonging to the Kingdom of Aragón, and together with the county it would become permanently French only in the 17th century. Some 5km to the north on the route through the valley lies the village of Formiguères where there are traces of a church, parts of walls and a tower in the square called 'Carrer del Castell'. The earliest mention of Formiguères church is in 873, while the castle is first mentioned in 1324 (Passarius *et al.* 1999, 5).

Les Angles' settlement consists of a series of houses arranged in a concentric form around a top on which the church and the castle are located. The church was entirely renovated in the 19th century, but its foundation is thought to be medieval. Archaeological evaluation of the castle began in 2000 (Vecchione 2000) followed by an extended excavation (Bergeret 2002). This highlighted two main phases, interspersed with a fire layer (Fig. 12.29). The first phase was broadly dated by ceramics to the 10th-12th century, although most are dated to between the 11th and the 12th century. This phase corresponds to the construction of the main building of the castle and the internal areas. The castle's moat, well and the first defensive wall also belong to this phase. This was followed by an intermediate phase,





*Fig. 12.29. The remains of the castle in Les Angles*

marked by a fire which was radiocarbon dated between 1214 and 1287 (Vecchione 2002, 37). A final phase was dated between the second half of the 13th century and the beginning of the 14th century, when the second defensive wall was built.

### ***Opoul Salvaterra***

Perched on a spur at the eastern end of the Corbières, the castle at Opoul is situated at an altitude of 400m.a.s.l. on a plateau of around 5ha in size (Fig. 12.30). Its strategic location enabled it to dominate the route passing between the foothills and Mediterranean Sea that links south-eastern France with the Iberian Peninsula. In Roussillon historiography, Opoul's plateau has been regarded as the location of an important proto-historic city, Sordonia, which is mentioned by Pomponius Mela in the 1st century AD and then by Julian of Toledo in 673. However, fieldwalking across the entire plateau has not revealed any evidence of this early occupation, only isolated finds of coins.

The castle at Opoul first appears in the written sources in 1100 in the form of Caslart, most probably linked to the seigneurial family of Opoul cited in written sources between 1149 and 1237. The village, mentioned in 1175, was located below the castle with its church, Saint-Laurent, documented in 1145 and 1153. After 1237, Opoul's lords are no longer mentioned in the sources relating to the castle and its territory. It is probably at this time that the seigneurie came under royal control, although there is no information on how the King of Aragón managed to seize the castle. However, its role can be linked to the militarisation of the frontier under King James I in the middle of the 13th century, with the border between the Crown of Aragón and France defined for the first time in the Treaty of Corbeil in 1258. James designated Opoul as one of the strongholds controlling the Plain of Roussillon. On 15 May 1246, he provided the castle with a village, granting the inhabitants of Opoul and Perillos the same rights as the inhabitants of Perpignan if they came to settle on the plateau. This



Fig. 12.30. The castle of Opoul Salvaterra, view from the south

act confirms the existence of a fortress called Caslart de Oped, which very likely corresponds to the feudal castle mentioned as early as the 12th century. The ‘*Puig*’ is now called Salvaterra, or Sauveté, recalling the privileges of its residents. Inhabitants are attested in Salvaterra as early as 1253, while the first houses or *domos* are only mentioned in 1278. The site becomes the centre of a royal lordship, however, the old village and its parish church Saint-Laurent retain some activity. From the 14th century, written sources indicate that the plateau was not sufficiently developed. In 1375, the inhabitants of Salvaterra were reminded that, in the event of war, they must take refuge in the castle and, for this, build houses and dwellings where they must stay to ‘live or die in this castle’. These recommendations correspond to the system of *recollecta* that is evident elsewhere in Roussillon and Cerdanya (Puig and Bayrou 2023). The local population contributed to the maintenance of the fortress in exchange for its protection in the event of danger. Where the financial contribution of the residents of Salvaterra was not expressed in the sources, they were asked to ‘*reculliat*’ on the plateau – to watch, patrol and defend the place under the orders of the castellan (Colin 1994).

Alongside the construction of the village, the castle was transformed into a royal fortress and housed a small garrison, consisting of up to fifteen men at the most. It was

governed by a castellan appointed and paid by the king. In 1360, François Çagarriga, a close confidant of the king, was given the mission of repairing the castle, a sign that the royal fortress was considered weak by then. The castle nevertheless retained its role as a border fortress until 1639, when it fell into the hands of the French. The garrison at that time numbered 72 men, who surrendered without fighting. Lieutenant Louis Nuñez Gerald was then convicted of treason and garrotted in Place de Perpignan. At this point the castle of Opoul lost its role as a frontier castle and was destroyed by the French army.

### Architecture

The castle is located at the south-eastern corner of the plateau, which is accessed by a ramp to the east, fortified with a barbican. It is possible an earlier access point was located in the north-west where there is a fault in the plateau. This was defended by a thick wall with three circular towers. The castle itself occupies a small rocky eminence delimited by a wide moat, with its scarp and counterscarp reinforced by masonry. Two towers, one to the south on the outer curtain wall, and another to the north-west, on the scarp, reinforce the castle. Today, only a large, vaulted room is all that survives of the core of the royal fortress. It opens onto a courtyard bordered by



the outer curtain wall, where the remains of latrines are situated. The character of the earlier feudal fortress can nevertheless be guessed: it occupied a narrower spur, with a smaller southern curtain wall onto which the south tower was built. Based on the data, it would seem that the royal works sought to enlarge the castle, raise the enclosed area and its associated path, consolidate the moat, reinforce it with an additional tower (to the north), and surround the plateau with an external curtain wall, punctuated by towers at strategic locations.

The entire plateau is covered with vast scree slopes amongst which fragments of walls are visible. These constructions correspond to the remains of the village and they are divided into about fifteen 'districts' of various shapes and sizes, but always conforming to an orthonormal plan. Without comprehensive excavations, it is not certain that all of these are dwellings. One of these structures was the focus of archaeological excavations in the early 2000s (Puig 2001). The investigation revealed three rooms, with some of their walls preserved to a height of almost 1.6m. The complete excavation of two of them revealed four occupation phases, ranging from the end of the 13th century to the end of the 14th century. This confirmed the relocation of the village to the Puig during the second half of the 13th century, while its abandonment seems to correspond to what is indicated in the written sources. The decline appears to have begun during the 15th century, and only a few buildings, which may be linked to the garrison, have been dated to the 16th century. To the north-west, a major hydraulic complex supplied the plateau with water: three large underground cisterns were created at the lowest point of a rocky peak, covered with plaster and constituting a sort of amphitheatre. These structures are exceptional in terms of their size but also their technicality. Other cisterns, smaller in size, can also be observed punctuating the plateau.

In summary, the castle of Opoul symbolises the actions of the kings of Aragón and then Majorca to defend the border of the 13th and 14th centuries against France. In the middle of the 13th century, the king appropriated this small feudal fortress, and reinforced the substantial plateau on which it is located with an extensive curtain wall, reinforced in places with towers. The castle itself was enlarged, the walls raised and the moat reinforced. But in order to reinforce the stronghold, the king established a *recollecta* on the plateau with fiscal privileges to attract settlers, who were then required to participate in the defence of the stronghold. The village developed in the form of 'districts' built according to an orthonormal plan and equipped with the necessary infrastructure, in particular, hydraulic. However, the 14th and 15th centuries saw the population on the plateau decline and relocate to settle in the area below. The system of royal militarisation involving the local population did not endure in the long term.

## Primary sites: Ariège

### Montaillou

Montaillou is situated on the northern slope of the central Pyrenean foothills in the Upper Ariège, within the Sabarthès region. The original settlement probably clustered around the Romanesque church of Sainte-Marie de Carnesses, but the first known fortified complex or *castrum* (referred to later as Le Castellàs) was built on top of the hill (c. 1350m.a.s.l.) overlooking the present-day village and the plateau of Aillou (or Alion) (Hallavant and Ruas 2008) (Figs 12.31, 12.32). Montaillou is of course famous for historical studies that have drawn on the early 14th-century inquisitorial archives of Jacques Fournier, the Bishop of Pamiers (Duvernoy 1965). Emmanuel Le Roy Ladurie's (1975) microhistory of the village has been foundational, inspiring a large number of studies examining Montaillou from a range of perspectives. These have included critiques of Ladurie's readings of inquisitorial sources (e.g. Brenon and Dieulafait 2000; Weis 2000; Brenon 2004; Laurendeau 2010; Davidson 2011).

The first mention of Montaillou is in the 12th century, as the centre of the small lordship of Alion; its ruling family were vassals of Aragón. They also controlled the *castrum* at Usson in the mountainous Donézan region. The territory of Alion was a frontier between Foix, the Pays de Sault, in the upper valley of the Aude dependent on Carcassonne and Razès, and the Donézan to the south which was largely controlled by the counts of Cerdanya. In 1208, Peter II of Aragón dispossessed Bernard of Alion of his lands and enfeoffed them to the Count of Foix. Bernard regained possession of his territory in 1236, marrying Esclarmonde of Foix and strengthening Alion's political ties (Ogé 1980, 68). However, as a supporter of Cathar heretics he was condemned and burnt at the stake in 1258, after which Montaillou passed again to the house of Foix. The castle itself is first mentioned in 1272, when it is included in a document that lists the fortifications of the Count of Foix. This list points to the consolidation of a linear, militarised borderland in the southern part of the county.

In the early decades of the 14th century, the entire village of Montaillou was the subject of two successive inquisitorial investigations. The first was led by Geoffroy of Ablis, inquisitor of Carcassonne, between 1308 and 1310, and the second by Fournier between 1320 and 1325. From these records it appears that the majority of Montaillou's population in the early 14th century was sympathetic towards and supported heretics. This included the leading family, the Clergues, who supplied the bailiff and priest of the village, and also acted as inquisitorial agents. Interestingly, the castle of Montaillou rarely features in the written sources, whilst the importance





*Fig. 12.31. The castle at Montailou*

of shepherding in the life of the village and the broader region is heavily emphasised.

### *Archaeology*

Following small-scale excavations of the keep on top of the hill in the 1960s and surveys in the 1970s, the first significant investigations of the fortified complex were directed by David Maso in 1998–1999. This involved consolidation of the keep's walls and surveys of the site (Maso 2000). Substantial archaeological excavations were led by Jean-Paul Cazes in 2000–2006 (Cazes 2000–2001, 2002, 2004, 2006; Cazes and Maso 2001). The excavations demonstrated the probable construction of the keep from the end of the 12th century to the start of the 13th century, along with the fortification of the adjacent plateau with two ditches and a curtain wall (Fig. 12.33). Within the enclosed area there was evidence for artisanal activity, including ironworking. In the southern part, two houses and a domestic annex were excavated.

The range of finds and quality of the constructions indicated they were inhabited by high-status residents, most likely related to the Alion family who ruled the associated fiefdom in the first half of the 13th century. Archaeological evidence for the deliberate destruction of one of the houses within the complex may potentially be connected to Bernard's fate.

Under comital ownership, the lordship was transformed into a frontier territory administered by a châtelain. At this point archaeological evidence suggests the site became more military in character, with the construction of a second wall, barracks and evidence for intense occupation until the end of the 13th century. In the area of the keep, finds of spurs and musket balls dated to the 14th and 15th centuries reflect the military character of the site, whilst the presence of glass and ceramics imported from Catalonia indicate the continued affluence of its residents. The remains of the houses on the eastern slope and base of the hill were also surveyed and one was excavated, and could be dated



Fig. 12.32. The castle at Montailou

to this later period. However, the character and date of most of the buried remains on the slope remain unclear. The keep was then restored in 1415. Although the counts of Foix had largely abandoned their southern fortifications by the end of the 13th century, Montailou's dual role as an administrative and frontier centre in relation to the new borderland established in 1258 ensured its continued use. But by the 17th century, the castle area appears to have been abandoned.

The excavations in the main building in the southern part of the castle enclosure revealed a central hearth and four pits containing waste deposits. These included a significant number of plant and faunal remains (Hallavant and Ruas 2008; Cazes and Hallavant 2009). The plant macrofossils have already been studied and published. They included charred remains of spinach (*Spinacia oleracea* L.), representing the earliest example of the species in Europe found to date, and the first from a rural context (Hallavant and Ruas 2014). Some worked bone has also been published (Rodet-Belarbi *et al.* 2002) but the faunal assemblages are recorded as part of this study for the first time.

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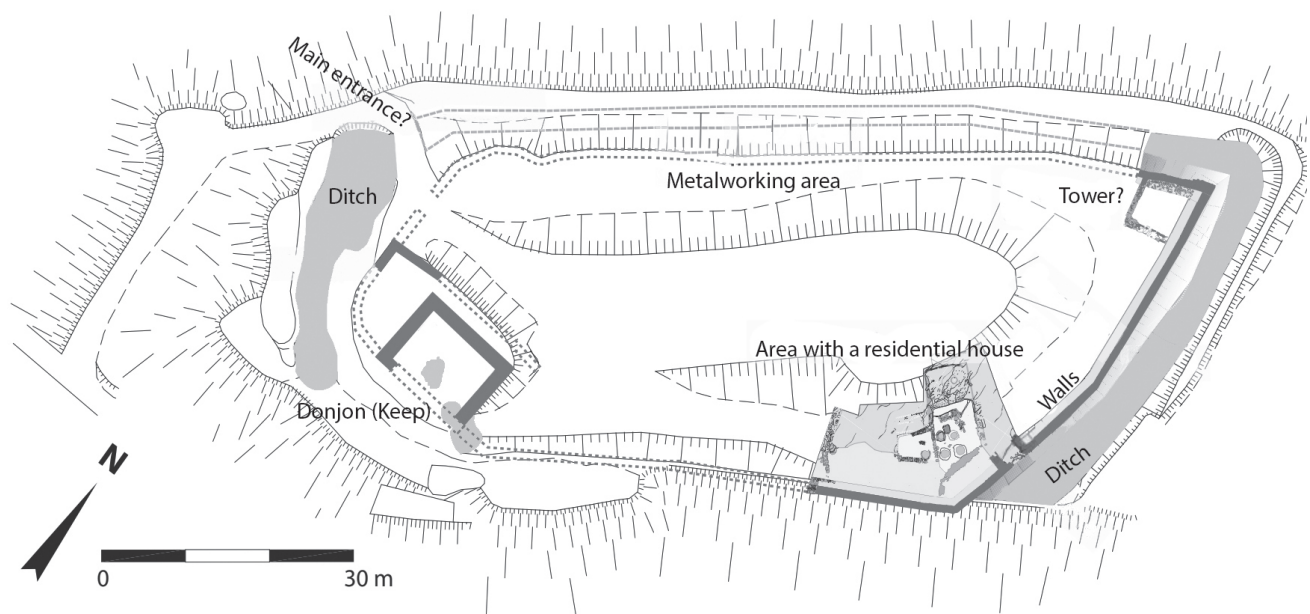


Fig. 12.33. Plan of the castle at Montailou (aft. Hallavant *et al.* 2008)



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# The impact of the Albigensian Crusade on the cultural landscapes of the eastern Pyrenean frontier (Pyrénées Audoises)

*Carole Puig, Margot Hoffelt and Jean-Michel Carozza*

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## Introduction

The Albigensian Crusade – a series of military campaigns sanctioned by the papacy against groups in Occitania it had designated as heretics – resulted in the strengthening of royal French power over the previously semi-autonomous borderlands of the eastern Pyrenees. This was accompanied by administrative reform and the reorganisation of the region's power structures which came to define the borderland officially demarcated by the Treaty of Corbeil in 1258. Royal officials replaced the local Occitan feudal lords and became the principal agents driving territorial governance. But what was the impact of this political transformation on the land itself? Did it result in profound social, cultural and economic changes, or was the new system of governance more of a superficial imposition?

Attempts to answer these questions face two challenges. Firstly, the consolidation of royal authority in this region took place over a long period of time. Some 60 years passed between the first crusading campaign in 1209, and the oath of loyalty sworn by the Occitan lords to the French king in 1271. In the meantime, the establishment of French governance, particularly in terms of administration, was hampered by significant local resistance. It was not until the beginning of the 14th century that royal authority was firmly in place, coinciding with the crisis of 1300 which has been identified throughout western Europe (Bourin *et al.* 2011). At the same time, a whole series of events that were independent of the Crusade had a variable influence on society in Languedoc during the 13th century. While the political, military and religious events are best documented in contemporary written sources, it is more difficult to define the economic, environmental, demographic or even social changes that the region was experiencing at the time. However, a comparison with the lands of the Catalan-Aragonese crown, adjoining Languedoc to the south, can inform our understanding of

the impact of the political changes and fill the gap in our knowledge to varying degrees.

The study presented in this chapter is based on a defined area situated at the eastern end of the Pyrenees, on either side of the border established in 1258. The last region to submit to French authority, the eastern part of the Corbières offers a more restricted chronological window for understanding the impact of the Crusade. To the north, it consists of the Aude Pyrenees region where the castles of Peyrepertuse, Aguilar, Quéribus, Termes and Puylaurens, or the Five Sons of Carcassonne as they are referred to in the later 15th century, are located (Bayrou 2000). The castles included in this study are located in a mid-mountain area, at the top of limestone ridges. Their placement is best understood from the perspective of a militarised cultural landscape. The easternmost, Aguilar, is less than 20km from the Mediterranean Sea (Fig. 13.1). To the west, rivers and streams have shaped narrow gorges which constitute a defensive element in themselves. However, this is weakened to the east by the opening of the valley floors and the presence of passes that punctuate the ridges. To the south-east of this line, Fenouillèdes, integrated into the French domain after 1258, represents a buffer zone that is subject in turn to the authority of the Catalan-Aragonese and then French kings. Finally, on the southern slopes of the 1258 border, the castle of Opoul-Salvatera, in Roussillon, and the site of Vallsera in Capcir are sites whose military and economic interests fall under the authority of the Catalan-Aragonese kings (Plate 13.1).

Finally, it is important to briefly outline the historical events which are pertinent to the case study area. Two military campaigns (1209–1210 and 1226) left Languedoc under French leadership; the Count of Toulouse became a subject of the King of France who now administered the territory of the Trencavels. In 1226, the offices of the seneschals of Carcassonne and Beaucaire were created, and the Treaty of



Fig. 13.1. Aguilar castle seen from the south (© Philippe Benoît, AMPM)

Meaux-Paris ended the war three years later. This agreement also enabled the crown to recover property confiscated from Occitan heretics. The rebels launched a final offensive in 1240 which failed and resulted in the further expansion of French dominion. Ecclesiastical lordships particularly benefited from regime change in the region, as they had also given their support to the fight against heresy (Tarde 1975). After 1244, Fenouillèdes remained outside the French domain until Puylaurens, Fenouillet and finally Quéribus fell in 1255. The viscounty definitively came into the possession of the King of France in 1258, upon the signing of the Treaty of Corbeil. In 1271, the Occitan lords swore an oath of loyalty to the king, but they were still resistant to royal authority. The territory was only completely subjugated at the beginning of the 14th century. These key historical milestones allow us to consider that, within the study area, the first effects of royal policy on the territory could be observed only from the second half of the 13th century. These may then be perceptible through written sources throughout the first half of the 14th century. Beyond that, the crises of the 14th century may complicate the attribution of any societal and environmental transformations to the political events associated with the earlier creation of the frontier.

## A territory in crisis?

### *Administrative resistance*

Royal authority finds its most obvious manifestation in the establishment of a structured administration. The study area was included in the new Seneschalty of Carcassonne which now accommodated the *curia regis*. This territorial division of the border was of particular interest to the crown. The district was further divided into *vigueries* (Fenouillèdes, Termenès, etc.), and the seneschal organised the distribution of military resources across these territories. He provided the royal fortresses with garrisons, first around Carcassonne, then to the south of the Seneschalty facing the border, in particular at Termes, Aguilar, Quéribus, Peyrepertuse and Puylaurens. The castles of Fenouillet (Saint-Pierre, Sabarda and Castel Fizel) were the first to be integrated into this fortified line.

But this restructuring was not without difficulties. Royal jurisdiction and the collection of royal revenues were the source of many conflicts. Hélène de Tarde (1975) demonstrated that the policy of extending the royal domain was driven by local agents in the seneschal's court and the king's representatives in Carcassonne. However, these same agents

also abused the authority delegated to them. This prompted Louis IX to order early investigations into affairs in Languedoc, enabling him to project a fairer image of the crown to his subjects and to place himself above the rapacious and officious actions of his officials (Dejoux 2014). But these embezzlements persisted; they targeted the Languedocians first, then the descendants of the recently established French barons. As a result, from 1265 there were tense relations between Guy de Lévis, Lord of Mirepoix, whose grandfather was one of Simon de Montfort's lieutenants, and Guillaume de Cohardon, Seneschal of Carcassonne and Béziers. To fulfill their duty as vassals to the king, the lords of Languedoc were required to reside in Carcassonne three months a year. Nevertheless, they continued to try to evade royal authority. The conflict hardened from 1272, when Guy de Lévis filed a complaint against the seneschal because the latter was hindering his rights, particularly in the administration of his fiefs and in the exercise of his jurisdiction.<sup>1</sup> Although Guy de Lévis represented the French authority and continued to flush out heretics, he dissociated himself from the administration of the Seneschalty. The structure put in place by the French crown therefore appears to have restricted the exercise of governance, irrespective of the lord's origins.

### *The crisis of 1300?*

The establishment of French royal authority coincides more or less with the phenomenon called the crisis of 1300 which largely affected western Europe, and which would foreshadow the difficulties of the middle of the following century (Bourin *et al.* 2011). From a Malthusian perspective, this crisis can be linked to the demographic growth of the 13th century, which contemporary levels of agricultural production could no longer sustain. Although demographic information is incomplete in the study area, the population seems, as elsewhere, to have experienced a visible boom during the 13th century. Indeed, in the Aude valley, documented plots of land were so small that it is difficult not to see this as an indication of the overpopulation of these territories (Bourin 2008). In this context, the Crusade and the devastation that accompanied it could appear as an aggravating factor. However, various indices suggest that the region was also experiencing an economic revival. The city of Limoux, for example, seems to have successfully weathered the difficulties. Although it was heavily taxed in 1305 for having participated in a plot with Carcassonne against inquisitors appointed to hunt heretics, it experienced a phase of unprecedented prosperity between the end of the 13th and the beginning of the 14th century (Romestan 1964). These nuances are observed more widely in Languedoc, which seems, in the end, less impacted by the crisis of 1300 than other parts of Europe (Bourin *et al.* 2014).

For the 14th century, although it is difficult to assess the development, extent and resilience of cultivation, some demographic indices can be highlighted. In 1368, 40%

of the localities of the Aude had between 0 and 5 hearths (with an average of 11 hearths across the entire area of the modern department). In the study area, between 1366 and 1395, 5 parishes were affected by hearth repairs with an average of 7 hearths (Raynaud 1986). The societies of the 13th century clearly appear to be suffering in the second half of the following century. Whilst these figures date to after the subsistence crises (1315, 1327–1328 and 1333) and the plague of 1348, it is nevertheless interesting to note that a large number of small settlements were already in decline. In the absence of demographic data for the 13th century, it is unlikely that a high mortality rate is the sole explanation for these abandonments. A restructuring of the landscape probably accelerated depopulation. In any case, in the light of these observations alone, this phenomenon cannot be easily related to the Albigensian Crusade.

Economic activity around 1300 is also difficult to assess, but it nevertheless seems to be developing. Land market prices are quite low, particularly in the Aude valley (Bourrin 2008). However, the buyers were mainly people linked to the administration of the Archbishop of Narbonne (priests, notaries or craftsmen), particularly in the area between Carcassonne and Béziers. The Church and its associated groups evidently weathered the impact of the Crusade well. Trade, fairs and Languedoc's textile activity were all developing in parallel. The seneschalties of Carcassonne and Toulouse seem more active than that of Beaucaire in the cloth trade in particular (Bourin 2008), and the development of fairs and markets in this region confirms its economic dynamism. Jean Combes (1958) also noted that the regions of the Seneschalty of Carcassonne most affected by Catharism were those where the drapery industry was clearly booming – primarily to the west of Carcassonne. To the east of the city, economic activities of regional importance are evident in Lagrasse and Limoux in the 14th century. In 1379, dressmakers and merchants from Lagrasse, Limoux, Revel, Alet and Quillan went to the fair in Lunel (Combes 1958). Their presence indicates that this dynamism also affected the small towns within the study area. However, although the Seneschalty was experiencing an economic boom, the region of the eastern Corbières seems to have fallen behind. This difference can be explained by the economic dynamism of the urban environment, in comparison to the more muted impact in the predominantly rural areas of the eastern Corbières.

It is therefore very difficult to define periods of crisis, demographic decline and economic depression in the study area. The information that is available is isolated, fragmented and difficult to correlate. Bourin (2008) has previously drawn attention to the complexity of the regional picture and the need for multi-disciplinary perspectives. However, a first assessment indicates that the establishment of royal authority does not seem to have slowed down the region's economic development, at least not in urban centres. The Aude, like the other regions of the Mediterranean South,



had a flourishing trade in the 13th century. This also reflects the presence of a dense population during the 13th century and a sharp demographic decline from the second half of the 14th century. Between these two dates, it is difficult to assess the demographic situation. This decline had a direct impact on the region's settlement pattern, which seems to shrink in the second half of the 14th century.

### *A tumultuous environment*

Land use is related to the development of the agrarian and natural environment. In this regard, the landscape of the Aude seems to follow a similar trend to its Languedocian and Catalan counterparts (Jalut *et al.* 1998; Galop *et al.* 2003; Bal 2006; Dolez 2018). Pollen analyses reveal that from the 11th century onwards, the landscape increasingly opened up with corresponding deforestation, and the exploitation of this territory visibly increased from the 12th century onwards (Davasse *et al.* 2013; Dolez 2018). In Cerdagne, the mountainous region to the south of the study area, the initial period of expansion of cultivated land between the 9th and 10th centuries is marked by significant phases of deforestation (Van Campo and Jalut 1969; Guy *et al.* 1998; Galop 2003). This trend was reversed from the 14th century onwards, when the regrowth of woodland points to a period of abandonment. However, this varied between valleys and may be connected with metallurgical activities which encouraged deforestation (Izard 1999). The situation is similar in neighbouring Ariège (Galop 2003; Simoneau *et al.* 2012). This pattern corresponds to periods defined by historical and archaeological sources which indicate a structuring of the landscape and an expansion of cultivated land from the 10th and 11th centuries, with an increase in cultivation between the 12th and 13th century.

However, the 13th century also marks the beginning of an era of significant climate change. Little work has been carried out on this topic within the study area. It is possible to identify fairly clear trends which are particularly noticeable in the sediments of the coastal bodies of water of Languedoc, located to the east of the territory in question. The data from the Berre lagoon indicates an increase in marked detrital events after 1200 (Faïsse *et al.* 2015). In the Vendres lagoon, fluvial sedimentation is evident at the end of the Middle Ages and contributes to the closure of the sandbar around 1450 (Mulot 2014). This phenomenon is interpreted by Tiphaine Salel as an expression of the Little Ice Age. It is also marked by a long period of intensified deforestation in the Pyrénées-Orientales and Languedoc (Salel *et al.* 2019). All these elements can be linked to the displacement of the mouth of the Aude, dated by written sources to 1316 (Larguier 2018). They indicate that, during the second half of the 13th century, sufficiently powerful floods led to defluviations and the sealing of lagoons during the first half of the 14th century.

Similar phenomena are attested in the Catalan-Aragonese territory during the same period with an equivalent intensity

(Carozza *et al.* 2009; Puig 2009). The analysis of the Vall-serra peat bog also illustrates this phenomenon in the mountains. Located in Capcir, at the source of the Aude, this high plateau opens directly onto the aforementioned valleys. Palynological analysis of the cores taken here indicates the first phase of deforestation corresponds to the establishment of human occupation in the valley between 995 and 1150. This transformation of the landscape would have instigated the beginning of peat formation. A second phase reflects significant detrital activity between 1225 and 1290, with a peak around 1270. This precedes the 14th-century phase of abandonment, with a slight lag in woodland regeneration. However, it corresponds to indicators in the Roussillon plain interpreted as marking the start of the Little Ice Age. Expanding on these observations, a clear decline in agricultural activity in the Serra du Cadi (Cerdagne) is evident between 1240 and 1380, with two particularly marked years in 1329 and 1380. This is interpreted as the same climatic phenomenon which sees a decrease in spring and summer temperatures (Ejarque *et al.* 2009).

Although the case study region is poorly documented in this regard, all the studies carried out in its periphery indicate a fairly coherent pattern. This is exemplified by the region between Mirepoix and Puivert. At the foot of the village of Puivert was a fairly substantial lake, which is documented as possibly having overflowed into the Hers valley with such force that the village of Mirepoix was destroyed and many of its inhabitants drowned. The sources that mention the catastrophe are secondary and have been repeated by numerous scholars, including contemporary historians and geographers, who have proposed two specific dates separated by ten years. The event is first mentioned in the Psalter of Mirepoix Cathedral,<sup>2</sup> on the feast day of Saint Cyr and Saint Julitte in 1279, i.e. 16 June 1279. This was noted by commentators in the 17th century (*Gallia Christiana, Marca Hispanica*). A second set of sources derives from the city's cartulary and reports the construction of the new settlement of Mirepoix following the flood. The city's founding charter, dated to the 5th of the calends of July 1289, or 27 June 1289, mentions the tragedy in its preamble (Pasquier 1921). The archives therefore show a gap of ten years between the flood and the reconstruction of Mirepoix, while the original site is presented as uninhabitable in the charter. It is therefore possible that there was a misreading of the date from the psalter, or it was miscopied. On the other hand, the date of 1289 corresponds to a set of distinct charters. Following the disaster, the university, consuls and lord chose a new location, agreed on the plot of land and established the associated jurisdiction. The fact that Guy de Lévis was already the instigator of two bastides supports the hypothesis of a rapid and already proven reconstruction.

The origin of the disaster is equally obscure. Scholars have speculated the dam on Lake Puivert gave way, which resulted in a massive influx of water into the Hers valley.

While the written sources mentioned above do refer to the watercourse, the link with Lake Puivert, located more than 20km upstream, is not clearly established. The landscape still bears traces of the low-lying area at the foot of this village. It is quite possible that its waters flooded the valley, perhaps as a result of torrential rain. This theory is given credence by research carried out in Roussillon in the last two decades, which has shown that the start of climatic deterioration can be dated to around 1270, coinciding with devastating floods that buried the villages in the plain under several meters of alluvium (Puig 2009; Carozza *et al.* 2013). The example of Mirepoix would fit into this overall environmental trend, but there remain many uncertainties. A more detailed geomorphological study may shed further light on the impact of climate change in the region. There are few examples of this type in the case study area, but the climatic deterioration of the 13th century is difficult to perceive beyond the incidents related to the region's watercourses. It nevertheless implies a drop in temperatures and most likely an increase in the impact of aeolian processes, particularly at the higher altitudes of the Corbières massif which reach 1231m.a.s.l. These climatic changes could have dealt a fatal blow to human communities living in a marginal environment and already experiencing significant difficulties.

## A changing population?

### Mapping medieval settlement

One of the notable features of this period is the desertion of nucleated settlements. This phenomenon, difficult to perceive clearly because it occurs over a lengthy period of time, enables us to characterise the difficulties encountered by the population. The Aude has been the subject of numerous studies concerning the distribution of medieval settlement (Raynaud 1986; Baudreu and Cazes 1994; Baudreu 1986, 2004). The impact of the Albigensian Crusade on settlement has been addressed particularly in relation to castle sites (Baudreu 2010).

In the former dioceses of Narbonne and Carcassonne, there were two main types of medieval settlement. Castle or castral villages located on the foothills represent 44% of the total, whilst open villages (32%) are largely found in the bottom of the Corbières valleys, particularly around Termes (Hautes Corbières) and in Fenouillèdes (around the castle of Fenouillet) (Baudreu 2004). But open villages are also present in the Pyrenean mountains as evident in neighbouring Catalonia; the village of Vallsera and the associated settlement pattern is a good example of this (Puig 2020). In the dioceses of Narbonne and Carcassonne, ecclesiastical villages are less frequently found (11%), and the Church attracted few settlements in this region, whilst new, bastide-type villages are extremely rare (1%) (Baudreu 2004). This observation reinforces Charles Higounet's (1949) study which noted the absence of bastides in the

eastern part of the Aude, east of a north-east/south-west line passing through Puylaurens.

However, this settlement pattern is affected by sequential periods of abandonment. Raynaud's (1986) statistical analysis of desertions in the Aude Pyrenees, a smaller region, indicated that 43% of medieval settlements were definitively abandoned here, which is far higher than the general average for the Aude of 33%. This figure is similar to the desertions of the Capcir, which affect between 30% and 35% of villages. This phenomenon is particularly accentuated along the left bank of the Aude (from the source of the Aiguette, then beyond its confluence with the Aude towards Axat) and in particular upstream of Quillan. However, to the east, desertions are much less marked, represented by only 13% of villages. The gap between the two banks of the Aude is notable. On the right bank, the population centres were far more resilient, however, the settlement pattern there was less dispersed, which slowed the disappearance of perhaps more modestly sized centres (Raynaud 1985). This reflects a historically different settlement pattern, but nevertheless one that is subject to the same process of development since it was also impacted by desertions. It is interesting to note that this trend corresponds roughly to Higounet's observation concerning the establishment of bastides, which are found in greater numbers to the west of this axis. Desertions are therefore more numerous in areas where the distribution of settlement is denser. This is also where new towns were more easily established, which are preferentially located on the plain. This, in turn, suggests that depopulation was also the result of population displacement.

Three phases of desertion can be observed (Raynaud 1985). Two of them, the abandonments of the 10th–11th and then the 14th centuries, have been identified in other regions (Puig *et al.* 2020). On the other hand, a phase of desertion dating mainly to the second half of the 13th century is specific to this region. It concerns ten localities, which consist of hamlets, parish centres and castral settlements. These desertions have been associated with the impact of the Crusade and the establishment of royal authority, and they are exemplified by the case of Niort.

The condemnation of William of Niort, after 1240, led to the confiscation of his property located in the Pays de Sault. As with all property seized from rebellious lords, this became part of the royal domain. In 1255, King Saint Louis ordered the complete destruction of the *castrum* of Niort. However, he also specified that the garrison must be removed *Castrum vero de Aniorto funditus say faciatis, ammota garnisione ejusdem*.<sup>3</sup> The village of Niort is then mentioned in 1231 as being composed of 70 houses (Baudreu 2010). In 1368, this settlement only had 40 hearths (Raynaud 1985). Of course, the number of houses can be distinguished from that of hearths, which reflects an economic power that may be restricted to a part of the community.



However, the impoverishment of the population is clear, and desertion is most certainly under way. The current village, located on the banks of the Rébenty, is the end result of this process. It is difficult to connect the demolition of the feudal castle with the displacement of the settlement insofar as the desertion of the latter took place within a well-known period of crises. However, it is likely that this demolition played a triggering role.

### ***Castral settlements***

The relationship between a settlement and a castle that came under the ownership of the French crown after the Crusade could represent an important barometer of the impact of royal authority on the region's population. Indeed, historiography has demonstrated the limits of settlement in the lower valleys in relation to the expansion of royal fortifications. However, Baudreu (2010) has qualified this observation by demonstrating a certain continuity of occupation beyond the conquest. Whilst the absence of archaeological investigations of relevant sites has prevented more detailed analysis, a few key features can be highlighted.

Each feudal castle was usually linked to a small settlement, as in Fenouillet where the village was located directly

below the fortified complex. Built on the slopes, when these were not too steep, dominated by the fortress above, these settlements and their limits are poorly known, and in the absence of archaeological excavations, poorly dated. Thus, in Aguilar, the presence of a village prior to the arrival of the representatives of the Seneschalty of Carcassonne in 1261 is not in doubt. The presence of this settlement, elements of which are still visible below the fortifications, resulted in the coexistence of the villagers alongside the royal garrison. Protected by a wall, it would seem that the extension of the royal castle only affected the upper part of the inhabited area, without really disturbing the settlement which continued to be occupied until the middle of the following century (Baudreu 2010). The small church of Sainte-Anne undoubtedly served as the village's parochial centre. In use at the time of the Termes family, it continued to function until the beginning of the 15th century (Fig. 13.2).

At Peyrepertuse, evidence for a small settlement was identified by fieldwalking surveys on the northern slopes of the spur. This village did not remain occupied after the 13th century (Quehen 1980; Baudreu 2010). Its desertion could indeed be linked to the events linked to the nearby fortress, however, in the absence of excavations, it is difficult to



*Fig. 13.2. The chapel of Sainte-Anne at Aguilar (© Philippe Benoît, AMPM)*



confirm this. Puylaurens fell into the hands of the French crown in 1250. The presence of a settlement associated with the seigneurial foundation is suggested from toponymic data and the discovery of evidence for anthropogenic activity on a terrace below the site. This is attested in surveys to the east of the summit of the rocky spur, and on its south-eastern slope, dated to the Central Middle Ages (Quehen 1980). However, written sources indicate that the relocation of the eponymous village was authorised by royal officers following a fire prior to 1339. In exchange for the payment of a fee, the inhabitants of Puylaurens relocated to establish the current village, further down the valley (Raynaud 2001). Documents from 1368 confirm the existence of at least 24 hearths.<sup>4</sup> The relocation is evident, but it takes place well after the conquest and the renovation work on the castle. In Quéribus, the configuration of the castle, a veritable eagle's nest, leaves little room for an associated settlement (Fig. 13.3).

Baudreu (2010) points out that, although these fortresses came under French royal authority between 1240 and 1260, some of their associated settlements remained occupied until at least the middle of the 14th century. That at Peyrepertuse may have declined earlier, but the dating of its desertion should be considered with caution (Fig. 13.4).

The settlement at Puylaurens, for its part, may have been destroyed by fire. This phase of decline corresponds to a general wave of village abandonment echoing the many crises of the late Middle Ages. The abandonment of high-altitude settlements in favour of lower-lying cultivated areas should also not be ruled out. The role of royal authority, systematically restricting settlement development for strategic reasons connected with the defence of the frontier, remains difficult to define even if a few cases are evident elsewhere in Languedoc.

It is also important to question the connection between the villagers and the occupants of the feudal castles before/during the period of the Crusade, and then with the royal garrisons stationed there. Indeed, should we consider the fortified sites as an extension of the village where its religious, economic and political functions were located? The presence of an old church situated outside the castle of Puylaurens is suggestive. Similarly, in Peyrepertuse, the church of Sainte-Marie had the status of a parish church (Bayrou 1990). What about the church of Sainte-Anne d'Aguilar? These feudal castles also served as major regional political and economic centres, where the local lords held their courts. As such, the installation of the royal



*Fig. 13.3. Quéribus castle (© Philippe Benoît, AMPM)*



Fig. 13.4. Peyrepertuse castle (© Philippe Benoît, AMPM)

garrisons significantly modified the non-military functions of these centres, which no longer had the cultural dynamism associated with the pre-Crusade political landscape. It is therefore also necessary to consider how regime change resulted in local communities' disaffection for these sites. This observation does not seem applicable to Fenouillet. The transfer of Fenouillèdes to the French crown in 1258 generated a significant reorganisation of the territory with the displacement of the administrative capital to Caudiès. The castle of Saint-Pierre was then slighted, a physical and symbolic break with the old seigneurial system. But whilst the peripheral fortifications of Sabarda and Castel Fizel were preferred by the new authority (Fig. 13.5), the castral settlement on the lower slope remained occupied. In this case, the disappearance of the viscount's castle did not have much discernible impact on the village.

In the context of the establishment of the southern border of France at this time, it is interesting to compare the dynamics of militarisation applied by the French crown with those of the Kingdom of Aragón, then of Majorca. The southern limit of the study area corresponds to the border line between the two kingdoms fixed in 1258. On both sides, rulers took

care to strengthen their defences in various ways. In the south, various strategies were developed which sometimes involved settlements.

In 1246, the community of Opoul was the subject of a settlement charter, forcing the inhabitants to relocate the village as close as possible to the royal fortress, on a large 4ha plateau. In exchange for tax privileges, they could also benefit from the infrastructure necessary for village life (church, cisterns etc.) alongside royal protection, since the entire plateau was fortified. Although the villagers settled near the castle and benefited from the many advantages that were offered by the crown, the living conditions there did not allow them to remain, and depopulation is evident from the end of the 14th century. However, the ruler of Aragón granted similar charters to other settlements to encourage their communities to do the same. They are evident during the first half of the 13th century at Bellver in 1225 (in Cerdagne) and at Puyvalador in 1246 (in Capcir). In the case of Opoul, as in Llivia (Cerdagne), the settlement charter is coupled with a new concept which takes the form of *recolleta*. This is clearly explained in relation to Llivia: the inhabitants would benefit from tax exemptions, as is the



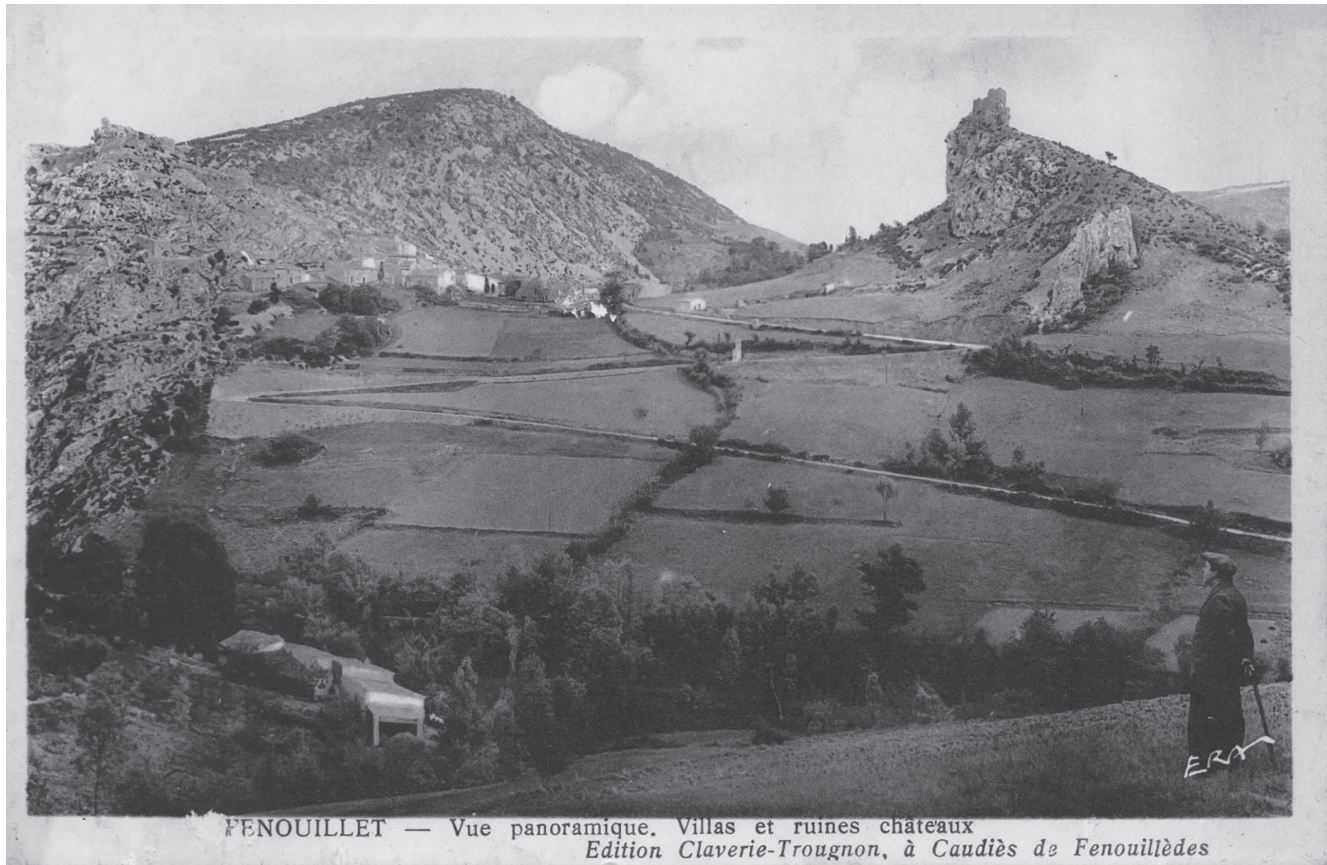


Fig. 13.5. The castles of Saint-Pierre-de-Fenouillet and Sabarda

case for the new towns and the bastides of Languedoc, on condition of maintaining a refuge for times of war within the castle grounds. They were also obliged to participate in the maintenance and defence of the fortress in the event of a siege. The local community therefore became an additional element in the consolidation of the royal fortress, by supporting the garrison, playing an active role in the event of a siege and contributing financially to the construction and maintenance of the fortification. This approach became widespread in Catalonia in the first half of the 14th century, where the population itself became a major element of the frontier's militarisation. Conversely, the population of Languedoc did not reinforce the military power of the Capetian royal castles. It is clear that the French administration did nothing to maintain the former settlements near the castles, and the militarisation of the frontier remained exclusively dependent on royal investment.

### French lords, entrepreneurs in Languedoc?

The confiscation and transfer of property from the *faidits* (those Occitan lords who were dispossessed) to Montfort's circle implies an upheaval in the management of the region's

lordships. These confiscations were not always definitive, and at times fiefs passed backwards and forwards, such as the castle of Puivert given to Pons de Bruyères. The activities of these new lords are not always noticeable in the first years following their territorial acquisitions. However, two cases are worth noting from the western edge of the study area. They both involve the creation of new villages. The first Languedoc bastides were established in the 1240s (Isle-sur-Tarn, Aigues-Mortes and Villeneuve de Carcassonne) and foundations intensified between 1280 and 1330. Monasteries often represented the origins of these foundations, but they were also associated with a powerful secular authority, typically the French crown (Abbé 2004).

Among the founders, major French lords stand out. Pierre de Voisins (1177–1235) was a crusader who distinguished himself first in the Levant and then from 1209 in Languedoc. A close ally of Simon de Montfort, he obtained many fiefs confiscated from the *faidits* located in the area between Termes and the Aude. In particular, he acquired the property of Olivier de Termes. His third son, Gilles de Voisins, inherited the lordship of Arques. He then undertook the creation of a bastide between 1280 and 1290, whose regular plan can still be seen today. He is also said to have



founded the bastides of Belfort-de-Voisins and Saint-Just-de-Voisins, but this remains to be confirmed. His descendant, Gilles de Voisins, was also connected with the foundation of the bastide of Arques (Baudreu 2010).

Another lord, Guy de Lévis, also appears as a powerful entrepreneur. Like Pierre de Voisins, Guy de Lévis was close to Simon de Monfort and was a marshal of Louis VIII. He had obtained the lordships of Mirepoix (whose lands extended between Limoux and Pamiers) and of Florensac, Pomerols, Sérignan, Villeneuve-la-Crémade, Salvian, Pourcayragne, Jouarres, Torolle and Thésan in the Lower Languedoc. This donation was confirmed in 1229 by the Treaty of Meaux-Paris.<sup>5</sup> The family remained the lords of Mirepoix until the Revolution. His descendant, Guy de Lévis III (1261–1299), was the instigator of two bastides in the same region, that of Lignairolles in 1265 and Ribouisse in 1271, before planning that of Mirepoix in 1289 (Pasquier 1920; Fig. 13.6). The foundation charters of the first two bastides are identical. The preamble indicates that the new towns will welcome those who have been oppressed by authority. This reference also appears in the foundation charter of Mirepoix. The foundation is then addressed to *people who, having escaped the tyranny of their masters, seek a gentler regime* (Pasquier 1921). In this last text, which responds to a somewhat unusual situation since the initial village had been destroyed, it is indicated that the charter was drawn up with the assent of the notables and the consent of the emigrants. These acts provide for the configuration of the new agglomeration, define various rights and ensure the appointment of consuls. However, in 1265 and 1271, the lord forbade the inhabitants of Mirepoix from coming to populate the bastides of Lignairolles and Ribouisse. The new foundations were therefore intended to attract the inhabitants of declining settlements, rather than drain the populations of stable ones. They were therefore aimed at the communities of the many small hinterland localities whose populations were rapidly declining in the 14th century. Guy de Lévis III comes across as an entrepreneur, anxious to boost the productivity of his lands, but also to meet the needs of their inhabitants. Through these charters, he also created a break with the old system of servitude, proposing instead an alternative form of land management based on consensus. The creation of universities associated with these bastides bears witness to this. But the royal administration was also involved in the birth of new villages. The bastide Saint-Louis was the result of a project involving the Seneschal of Carcassonne, Guy Chevrier, and the co-ruler of the city, Guillaume de Castelport. Dated to 1299, the founding act specifies that it was created for *utilitatem pacis* (Raynaud 2020), although it bore the name of the French king.

The French lords who obtained their lands following the military campaigns in Languedoc, and in many cases also in the Levant in association with the crusades, left their heirs vast estates to reorganise and manage. The latter, always close to the king, were heavily invested in

the development of these new territories. The creation of the bastides therefore corresponds to the need for estate management but also reflects the evolution of local social structures. However, it would only be the second or third generation of French barons who would have a noticeable impact on the territories which their forebears obtained through force and confiscation.

### Capetian military architecture

Capetian rulers chose to renovate the old Occitan castles following a model already well developed in France, but adapted to the specific situation in the Corbières, where the militarisation of the frontier relied on a small number of professional garrisons. As a result, the building work undertaken was similar in character in all the fortresses which were designated as borderland strong points, reflecting a relatively short period of investment from a single, centralised authority. The castles of the Corbières Massif, in terms of their location and architecture, form a homogeneous corpus of buildings readapted to the military strategy of the Capetian dynasty to create impassable barriers along the frontier. From the second third of the 13th century, the Master of the King's Works was in charge of this building programme exemplified by the Five Sons of Carcassonne. Despite their architectural variations, these fortified complexes shared many common features.

Firstly, it is evident that local topography largely determined the architectural choices adopted by the builders. The castle wards are fitted to the morphology of the rocky spurs they are built on, following their shapes and contours. This is exemplified by the curtain walls of Peyrepertuse which closely follow the shape of the rock face which extends their verticality. The principal towers are systematically placed at key points on the spur. Here, the former keep was preserved, but a new fortified centre was built on a higher and steeper area. At Puylaurens, the chicane providing access to the lower enclosure of the castle is built into a natural fault, transforming a weak point into a military asset (Fig. 13.7). Similarly, the Saint Louis staircase providing access to the Sant Jordi keep is dug into the rock, while taking full advantage of the relief.

The rocky spurs were regularly shaped to meet construction needs, particularly when it came to levelling surfaces for constructing buildings, as evident from traces of tools observed on the bedrock in Quéribus castle. As with many castles, these became *in situ* quarries. In Aguilar, the digging of a small defensive ditch at a location where the curtain walls were vulnerable, provided building materials for the construction of the royal castle. Traces of stone extraction are also visible on the site's eastern flank. In Peyrepertuse, the summit platform served as a quarry and enabled the levelling of the peak for the installation of the Sant Jordi keep. It is therefore necessary to question to what extent

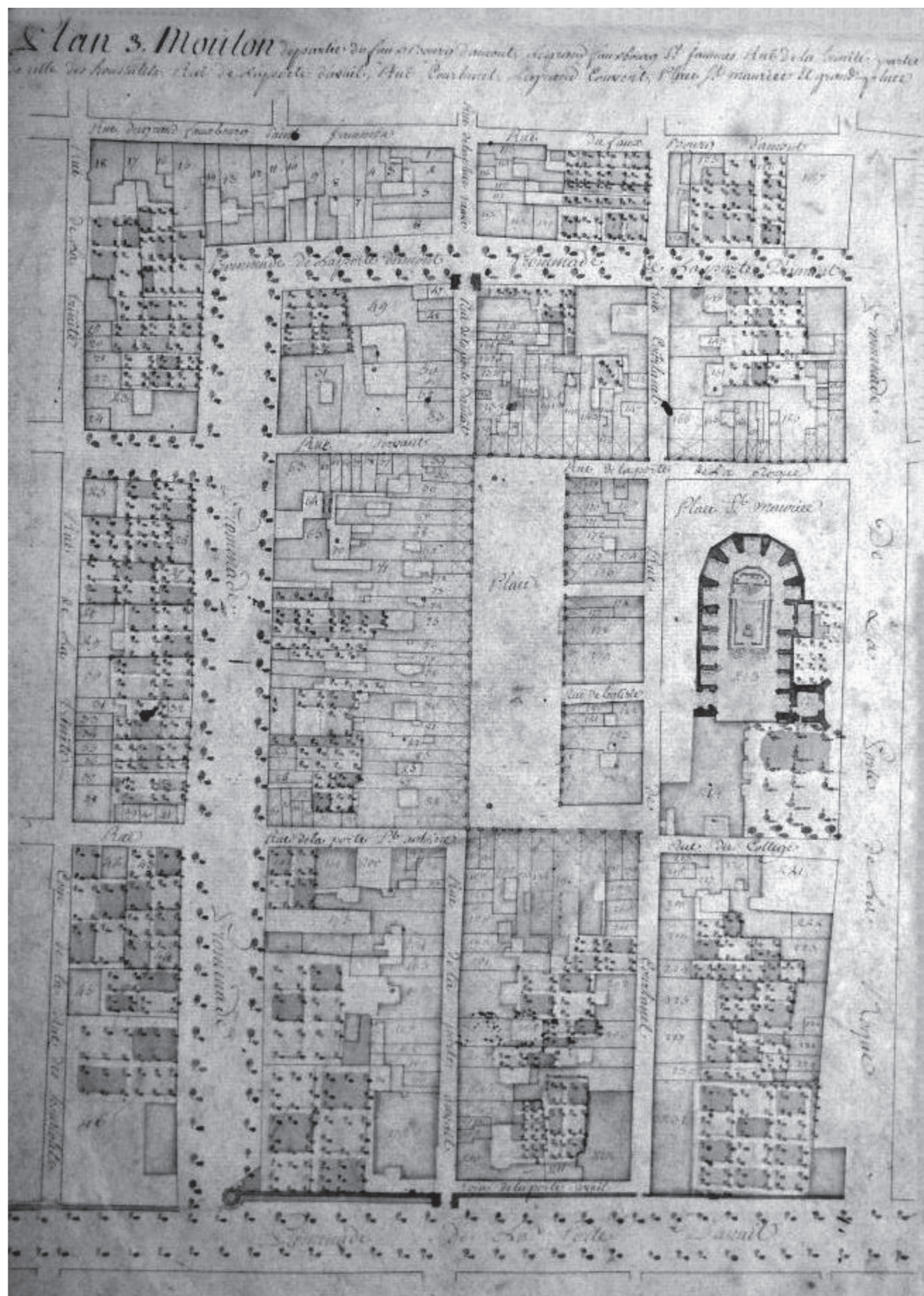


Fig. 13.6. Plan of the bastide of Mirepoix, archives of Ariège, 312EDT/CC3, 1766





*Fig. 13.7. Puylaurens castle showing the hillside cleared of trees*

the land was adapted to the construction programmes, and vice versa (Fig. 13.8).

Although the bedrock was used as a quarry for the construction of the majority of the frontier castles, there are some exceptions. Saint-Pierre-de-Fenouillet stands out in particular because it includes a greater diversity of materials: the tufa used for its keystones most probably derived from quarries close to the upper Agly valley (Tirounère in Saint-Paul-de-Fenouillet, Clot-del-Tury in Ansignan). Sandstone beds also form outcrops in Lansac, Corbous and Arsa. Finally, the limestone-marble of Estagel (Saint-Pierre) could have been used for the cut stones of nearby castles (Latour-de-France, Cuxous) (Porcel 2002). From this, should we conclude that particular care was taken with the viscount's fortress?

In any case, the homogeneity of construction observed in the other castles built during the royal period most likely reflects economic factors. Puylaurens and Aguilar are built exclusively in limestone, except for occasional sandstone elements (Bayrou 2019). At Peyrepertuse, sandstone outcrops on the site were exploited in the same way as limestone. However, tufa is also used and must have been transported accordingly: at Quéribus, the foundation of the keep is built in cut stone from a quarry located almost 4km

away (Las Fontetes) (Bayrou 2013, 46). In comparison, the castle of Opoul-Salvaterra, placed under the authority of the King of Aragón during the 13th century, uses exclusively local limestone, undoubtedly extracted from the site, and in particular from the moat. Here again, the royal investment favoured local, less expensive building materials.

Accommodating at times difficult topography, the builders, insofar as they remodeled seigneurial foundations, also had to deal with pre-existing structures. This resulted, in particular, in more extensive exploitation of the bedrock, through a duplication of the original fortified enclosures. This is clearly visible at Aguilar where the line of the seigneurial and royal fortifications is concentric in plan. At Quéribus, terraces were formed by the addition of two additional lower enclosed areas. At Puylaurens, the destruction of a large part of the former seigneurial site required the rebuilding of the original enclosure and the creation of a new defensive line below, creating a second stronghold (Hoffelt 2024). At Peyrepertuse, the royal castle includes the old residence preserved in the lower enclosure, and a new construction, the Sant Jordi keep, erected on the highest point. In the centre, an expansive flat area occupied by a few buildings and a tower links the two. Whilst the building solutions differ from one site to another, the overall approach





Fig. 13.8. Peyrepertuse castle (© Philippe Benoît, AMPM)

is identical: identifying the natural advantages provided by the rocky bases, shaping them according to architectural needs, and utilising the remnants of the earlier, feudal constructions as much as possible.

Other elements are recurrent and suggest an emphasis on military considerations. The use of elaborate flanking systems ensured that all the access points to the castles were protected, along with all approaches to the curtain walls through the distribution of firing positions. At Aguilar and Puylaurens, the newly constructed wards were equipped at the inflection points between their curtain walls, with circular towers containing arrow slits arranged in a staggered pattern. Furthermore, at Quéribus, Puylaurens and Peyrepertuse, hoardings were probably fitted at the base of the crenellations and *asommoirs* were also planned above the main entrances. Royal builders regularly used bossage in the constituent modules of the towers, whether at the height of their truncated bases as at Aguilar, or in their elevations as at Puylaurens (Fig. 13.9). At Quéribus, a firing platform for cannons located to the south-east of the castle was probably counterbalanced by the construction of a casemate (a room adapted to firing guns). Several gun ports were also created in the lower enclosure and in the parapet

of the summit platform of the main tower. Adaptations to developments in artillery were therefore included as both defensive and offensive features.

In general, the architecture of the castles of the Corbières massif traditionally designated as Philipian is well defined. This term refers to a model of royal fortifications constructed during the 13th century, which is characterised by unitary enclosed wards, flanked by circular towers with arrow slits. These structures, above all, symbolised the affirmation of royal power (Hayot 2021). Belonging to a discrete architectural phase, they are distinguished from other royal investments carried out south of the border by their homogeneity. The Catalan-Aragonese kings did not have the means to invest in an architectural programme of this magnitude. Their fortresses, such as Opoul or Puyvalador, for example, were certainly reinforced and equipped with the latest defensive elements such as the addition of circular towers and new wards, but they do not reflect a single, cohesive programme of building. The builders opportunely used previous constructions, exploited the natural rock and local quarries, and whilst architectural trends can be observed across all sites, they were not systematised.



Fig. 13.9. The donjon of Puylaurens castle (© Philippe Benoît, AMPM)

This can be qualified with two further points. The first concerns the bastide of Olette (Conflent) and the castle of Llivia (Cerdagne) which adopted the typical form of the Philippian castle: a quadrangular enclosure flanked by towers at the corners (Fig. 13.10). Probably the work of the same master builder, these two sites are clearly distinguishable from traditional Majorcan constructions. Constructed *ex nihilo*, they remain atypical and are probably the result of an imported French building tradition. The second concerns a group of structures commonly referred to in the scholarship as signal towers. Distributed throughout the territory to provide a warning system in the event of an invasion, they reflect a royal construction project although they are not identically constructed (Puig and Bayrou 2023). In summary, investment in frontier fortifications by the kings of Majorca and later Aragón is relatively less significant than on the French side of the border, and it does not result in the development of a cohesive programme of building.

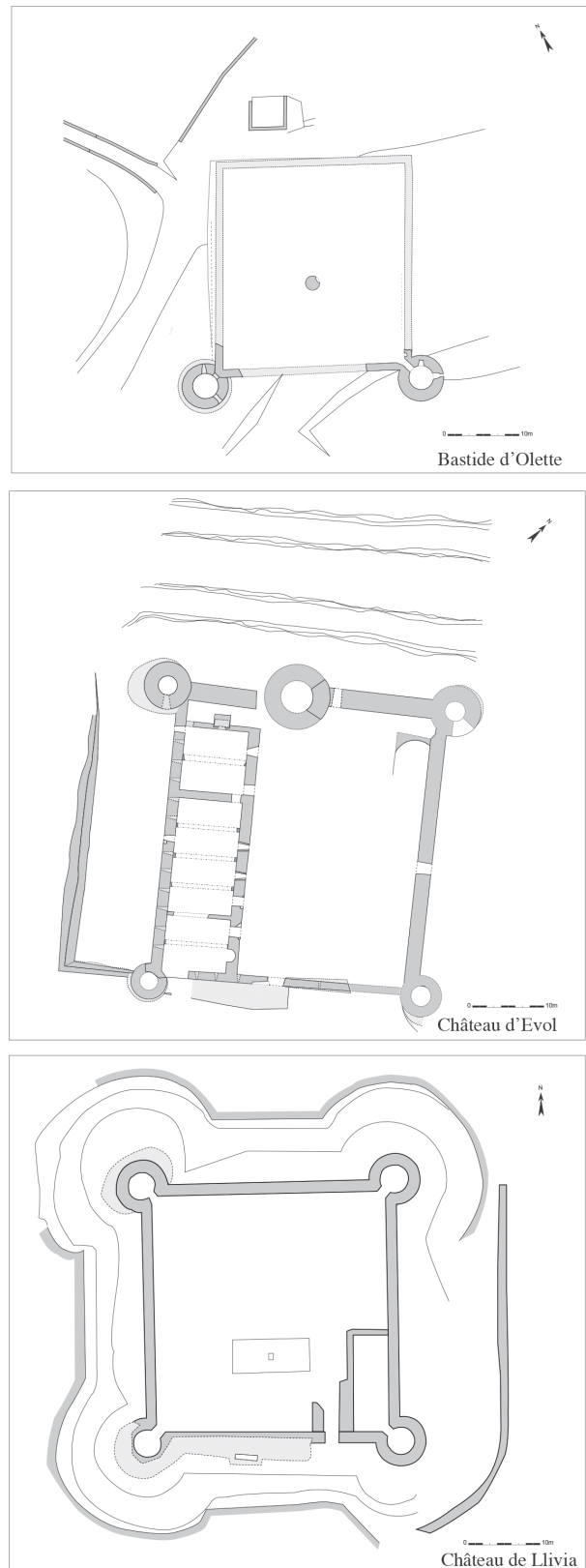


Fig. 13.10. Plans of the castles of Llivia, Evol and the bastide of Olette (Carole Puig and Lucien Bayrou)



## Conclusion

The establishment of French power in Occitania after the Albigensian Crusade initially took the form of an administrative restructuring that was difficult to impose on both the population of Languedoc and the second generation of French barons. The resistance it encountered was partly due to the authoritarian character of the new approach to territorial management, further exacerbated by abuses of power by royal officials. The impact of this political transformation on the population and the territory is more difficult to assess. The general absence of written sources and the conjunction of various crises mask the nuances of this phenomenon. As in neighbouring regions, the impact of climatic deterioration is evident. Whilst it was disastrous for some of the settlements in the plains from the last third of the 13th century, it is difficult to evaluate its impact on the foothills of the Corbières. At the same time, the demographic boom of the 13th century is attested in the study area, but the population then experienced a significant decline from the middle of the 14th century. However, this does not seem to be related to the crisis of 1300. The region was experiencing difficulties, but this did not limit economic growth in the plains and particularly in urban centres, while the land market remained dynamic in the hinterland. Strikingly, the Crusade does not seem to have impacted on the regional economy.

From the middle of the 14th century, many villages were deserted, particularly on the left bank of the Aude, where the settlement pattern was more dispersed. On the right bank, where nucleated settlements were more prevalent, desertions were less numerous. These abandonments were a response to the demographic decline linked to the crises of the late Middle Ages, but they could also be explained by population movements and a restructuring of the settlement pattern. It can indeed be noted that the establishment of the bastides on the left bank of the Aude coincides with the desertion of the smaller medieval settlements. As a result, our estimate of the demographic decline observed in the middle of the 14th century requires further moderation: the fall in the number of hearths perhaps indicates an exodus towards the new centres built mainly between 1240 and 1330. In fact, several new settlements emerged between the 13th and 14th centuries. They were preferentially located on the plain and were fully integrated into the region's booming commercial network. Furnished with a charter, they guaranteed a certain autonomy to their inhabitants who now had an active role in village management. On this point, the second-generation French barons appeared as major investors in their territory, as indicated by the example of Guy de Lévis. Although more detailed written sources are lacking, it seems that other French lords also played this role. In this respect, the Crusade did have an immediate impact on the development of the region, but its lasting effects were felt during a later phase and involved this secondary group of lords.

In the hinterland of the Corbières, the settlement pattern was less scattered, and therefore less conducive to the creation of new villages. The economic dynamism that is evident in the neighbouring regions and the plain is less visible here. Similarly, the link between the desertion of castral villages and the transfer of these castles into the hands of the French crown remains tenuous. Certainly, the function of these key frontier sites transformed from a seigneurial to a strictly military one; however, the associated villages were not negatively impacted by this shift. Where there was desertion, other causes should perhaps be considered; the transfer in castle ownership was perhaps in the end only a triggering factor. The strategy of the Catalan kings provides an instructive counter example, insofar as they were particularly active in associating the local population with the defence of their political frontier. They used various strategies to implement this. The King of Aragón and then of Majorca tried to engineer these new communities by means of charters creating settlements near fortresses. The garrison remained a purely military establishment while the village nearby had its own, distinct institutions. However, the settlement charters were insufficient and the system of the *recolleta*, which developed during the 14th century, was more effective. Having taken refuge within the walls of the royal fortresses that they had helped to maintain, the inhabitants also took an active part in their defence, thereby reducing their running costs for the monarchy. In Languedoc, it is difficult to assess the relations between the population and the new royal fortresses. Villages appear to relocate away from them during the 14th century, perhaps because they no longer fulfilled their earlier social and economic functions. In the event of war, they could still serve as a place of refuge for local communities. Yet the French chancellery never formalised this relationship in the way that was evidently structured on the other side of the frontier, where the population was leveraged as a pillar of military support for the crown.

The French royal administration focused on the reinforcement of the frontier castles and thus provided a model for their reconstruction. The castles of the Corbières massif are associated with fairly well-identified architectural trends. Placed at the point of convergence between strategic necessities, topographical constraints, economic practicalities and architectural innovations, these monuments still have much to reveal about a major period in the history of Languedoc which largely defines its landscapes today (Fig. 13.11). Their Catalan counterparts present similar characteristics. The treatment of the rock base, the adaptability to the natural environment, the reuse of earlier buildings, the adoption of crenellated curtain walls, the installation of arrow slits and flanking architectural elements should be examined further to distinguish the nuances between the Languedoc and Catalan architectural styles. But if the techniques are similar,





Fig. 13.11. Puylaurens castle (© Philippe Benoît, AMPM)

the distinction is clear in the development of the building programmes: the French crown set up a unitary architectural programme that contrasts with the occasional interventions of the Catalan-Aragonese kings. Thus, the strengthening of French royal power was a top-down process. It saw the imposition of a centralised fiscal, judicial and military administration, but it was implemented on the ground by the establishment of French barons in the region who serve as drivers of economic dynamism. In the eastern stretches of Languedoc, more remote than Corbières and conquered only later, the impact of this political transformation is less clear and seems more withdrawn, particularly from an economic perspective. In this respect, the cultural landscapes across the Pyrenean frontier were transformed following political restructuring in the 13th century, but multiple factors played a role in reshaping them after the trauma of the Albigensian Crusade.

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### Notes

- 1 *Inventaire historique et généalogique des documents de la branche Lévis-Léran, devenue Lévis-Mirepoix, T. III*, 1909.
- 2 Psalter of Mirepoix Cathedral, 1–67; Manuscripts of the Foix media library.
- 3 *HDL* VIII col. 1362.
- 4 *Ordonnances des rois de France de la troisième race*, Paris, 1734–1745, t. V, 30–31 (1368), t. VI, 286 (1377), A.D. Aude, 2 J 58 (1382, 1395) (Raynaud 1985).
- 5 *Inventaire historique et généalogique des documents de la branche Lévis-Léran, devenue Lévis-Mirepoix, T. III*, 1909.

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# Beyond borders and politics: The resilience of human-animal interactions after the Albigensian crusade

*Dianne Unsain, Tatiana André and Audrey Roussel*

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## Introduction

This chapter explores the impact of the Albigensian Crusade on human-animal interactions by analysing faunal remains from three strategic castles: Le Castellat (Montaillou), Peyrepertuse (Peyrepertuse-sous-Duilhac) and Saint-Pierre (Fenouillet). The aim is to identify the socio-environmental repercussions of the creation of a new frontier following the integration of the seigneuries of the south-western Pyrenees into the kingdom of France in the 13th century. We also aim to discuss the permeability of this frontier in terms of people, animals and goods. Our focus lies primarily on the differences between the settlements occupied by the *Faidit* families, their broader households and Cathars and those occupied by the garrisons of the kingdom of France (mainly between the 13th and 14th centuries). The zooarchaeological study of these castle assemblages covers 9559 remains, 3343 of which are identified at anatomical and species level (NISP) and is largely supported by the work of historians (e.g. Le Roy Ladurie 1985; Petrowiste 2004; Coste 2021). Taken together, these approaches shed light on possible changes in diet in relation to commercial practices, livestock rearing, craft activities using animal resources, as well as political contexts. These castles were centres of governance and key consumption points, and their faunal assemblages constitute the most important datasets for animal exploitation in the selected micro-regions. Biometric and isotopic analyses are currently underway and will add to the discussions begun in this contribution.

## The historical frameworks

### *The political context*

Before the Albigensian Crusade, the lords of the south-eastern Pyrenees were semi-autonomous vassals of the counts of Barcelona and Toulouse, and the Viscount of Carcassonne. The Crusade (1209–1229) aimed to eradicate the widespread heretical movement in the region,

supported by local lords. The end of the Crusade marked a major turning point: some Occitan lords lost their lands, which passed from the control of local landlords, termed here ‘feudal’, to the royal authority of the French crown. In 1258, the Treaty of Corbeil further reshaped the political landscape, transforming the mountains into a new frontier between Aragón and France, and reorganising the lands as royal domains. This period also saw the construction of strongholds to monitor the border (Bayrou 1993).

According to existing literature, human-animal interactions remained resilient despite these political shifts. Evidence of persistent Catalan influence in border areas includes material culture, such as 14th- to 16th-century Catalan ceramics found at Montaillou castle (Cazes 2006). Transhumance and the spread of heretical ideology are documented in early 14th-century inquisitorial records from Montaillou (Le Roy Ladurie 1985). The archaeological record, including sites like Cabaret, also highlights the influence of French control in some areas (Gardel 2004).

### *The socio-economic context*

The region’s urban centres benefited from an extensive and organised trading network. Toulouse, for example, was a major hub for livestock traders and a meat market, involving breeders, merchants and butchers. By the mid-14th century, Toulouse, Carcassonne, Narbonne and Limoux were also renowned for their drapery. While the artisanal and commercial aspects of the processed animal (by-)products are well known, the earlier stages, particularly wool supply, remain less known. Urban centres not only controlled their own supply but also redistributed goods in surrounding areas. Medium-sized towns in the region had a radius of influence of 10km to 20km, while larger towns, like Toulouse, could reach up to 40km. Livestock and pasture lease agreements with more distant localities reveal even wider secondary influence zones (Bochaca 2005).

Aristocratic sites of the 10th–12th centuries mainly functioned as consumption centres, importing much of their food. At that time, commercial sites began flourishing in rural areas, with around 60 merchant assemblies emerging south of Toulouse, generally near castles and churches. Both great and local lords integrated trade into their estates. In the region, the close link between commercial activities and seigniorial power can be seen in the location of the market, often set within *castrum* walls, sometimes even in courtyards (Durand *et al.* 1997; Petrowiste 2004). From the 13th century onwards, the growing population around castles and the rise of fortified villages increased inhabitants' influence on the landscape. By the 14th century, population growth led to intensified peasant production, transforming villages into balanced economic hubs combining agriculture, livestock, forestry and trade (Durand *et al.* 1997). In the 13th–14th centuries, more than 500 commercial sites were reported in the region.

The meat trade, particularly how people procured meat, is central to understanding the sites studied. In Languedoc, meat sales became professionalised early, with the first mention being made in Toulouse at the beginning of the 12th century (Stouff 1970). Over time, local authorities increasingly regulated meat sales to ensure consumer safety and access for all the population, even in times of crisis. In 1322, 177 butchers (*macelliers*) were supplying Toulouse (Stunault 2017). The animals may have belonged to the butchers, who could breed them or entrust their care to peasants until sale (Stouff 1970; Bochaca 2005). Account books also mention animals (in this case, pigs) purchased from various places within a radius of 70km of Toulouse. Toulouse's *macelliers* also supplied towns in the region, such as Castelnau and Limoux, nearly 80km away (Wolff 1953; Bochaca 2005).

Butchers not only supplied towns, but also the countryside and castles. Until the early 14th century, southern French lords commonly claimed a portion of any slaughtered animal from the butchers working on their lands. This enabled them to supply their tables with hams and other quality products. However, products sold in towns and villages were likely not identical. Urban butchers probably offered more varied selection, while villages also relied on their own production (Petrowiste 2018). Local textual sources indicate that butchers did not generally cut the meat based on the contemporary organoleptic qualities of the anatomical parts, but rather as and when it was sold. The price was therefore set according to the species, age and sex of the animal (Wolff 1953; Petrowiste 2018).

### *The 14th century, a time of plagues*

The 14th century is known as a time of crisis in the West (Campbell 2016). Whether due to plagues, the Hundred Years War or famines caused by poor harvests and the vagaries of the climate at the beginning of the Little Ice Age,

the end of the Middle Ages saw demographic, economic and social decline (Petrowiste 2004). Although the south-west of France was not spared by the Hundred Years War, it was relatively little affected. Disruption to trade was quickly contained by royal intervention and flexible local networks (Petrowiste 2004). However, the Plague, shortages, rising prices and occasional famines did hit the region. Montailou, for example, lost half its population by the late 14th century, mostly due to plague. Food shortages, rare in 13th-century Occitania, became common in the early 14th century (Le Roy Ladurie 1985). In response, urban populations adopted measures that benefited both towns and countryside. These consisted of strengthening links with the countryside by buying land outside the town and increasing livestock contracts. The aim was to promote livestock farming close to urban areas and to provide for the care of the animals (Wolff 1990).

### *The sites studied*

The historical context for these sites is outlined in Chapter 12. The details of the faunal assemblages included in this study (Fig. 14.1) are provided below.

#### *Le Castellat – Municipality of Montailou*

Faunal remains from the Castellat were studied at the Centre de Conservation et d'Étude in Tarascon-sur-Ariège. As the faunal collection was very large, and the contexts sometimes disturbed, the decision was taken to concentrate on the stratigraphic units in zones 3 and 4 (Maso and Cazes 1998; Cazes and Portet 2001, 2002). Situated in the south-eastern part of the castle platform, zone 3 corresponds to a circulation space along the enclosure. Located at the north-eastern end of the castral platform, zone 4 comprised, in the feudal period, an aristocratic house probably occupied by subordinates, and part of the circulation area along the ramparts. From the royal period onwards, the buildings disappeared and the two areas, still an integral part of the farmyard, became circulation areas.

#### *Peyrepertuse Castle – Duilhac-sous-Peyrepertuse*

The Peyrepertuse collection was studied at the LAMPEA laboratory (CNRS, UMR 7269), located in the Maison Méditerranéenne de Science de l'Homme in Aix-en-Provence. The fauna analysed came from the castle area (zone 1). They are all dated to the royal period and come from a vaulted underground hall of the keep (sector 1) and a quarry area (sector 2).

#### *Saint-Pierre Castle – Fenouillet*

The analysis of the faunal remains from Saint-Pierre castle was carried out on the premises of the private preventive archaeology company ACTER archéologie, based in Baho (Pyrénées-Orientales). For this site, we also relied on some previous identifications and comments by Vianney Forest<sup>1</sup>



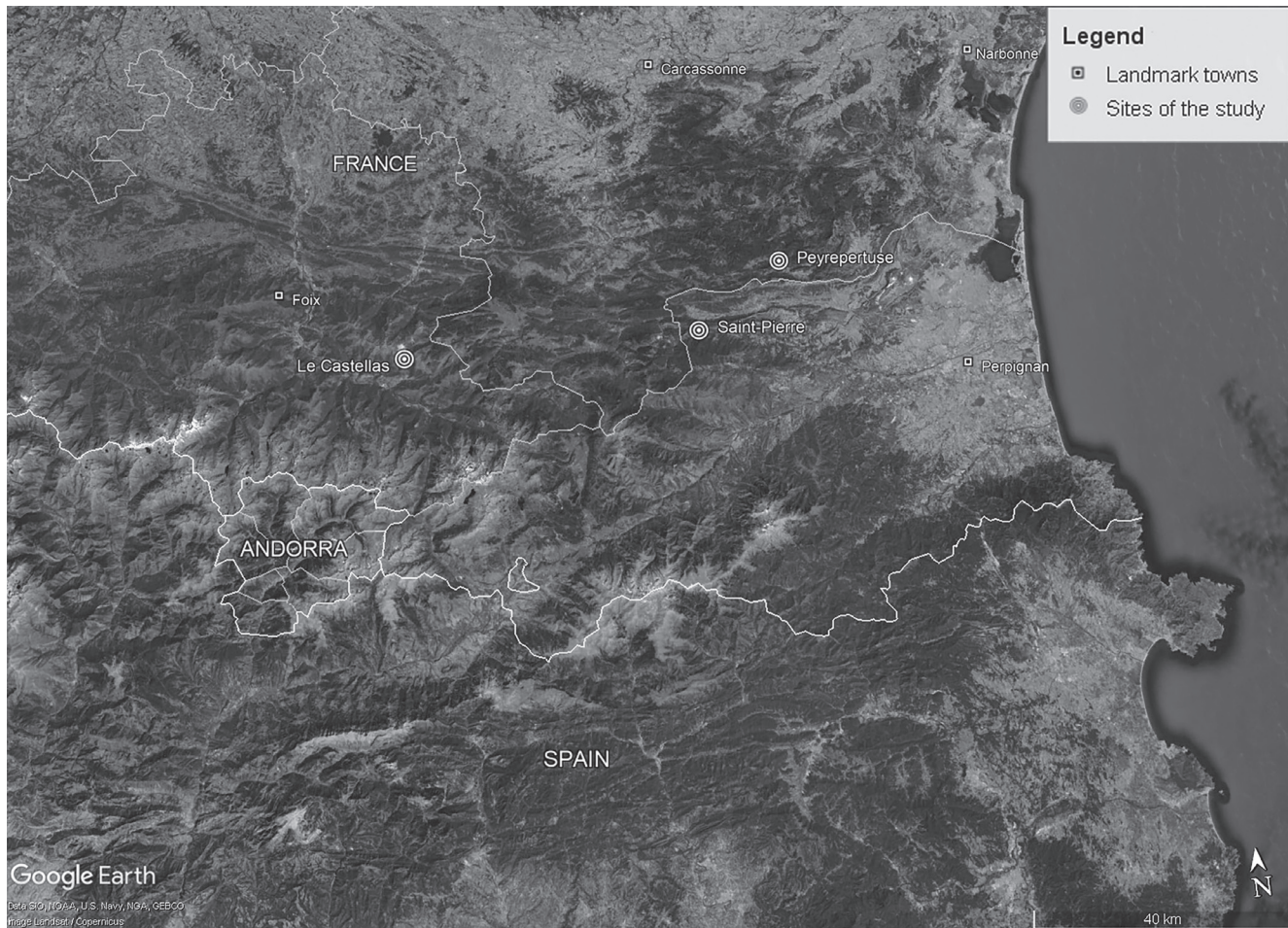


Fig. 14.1. Geographical location of study sites (Map data: Google, SIO, NOAA, U.S. Navy, NGA, GEBCO. Image: Landsat/Copernicus)

(Forest and Piques unpublished 1999; Forest unpublished 2004). The material studied comes from two areas that yielded abundant faunal remains: the summit building (zone 1) and the vaulted building erected against the defensive wall (zone 5). The first phase corresponds to the feudal occupation of the Fenouillet family, between the end of the 12th and the middle of the 13th centuries. The second phase comprises occupation levels from the second half of the 13th century, corresponding to an early royal period, at the end of the feudal period and the transition to French royal rule (Maso 1998b). The third phase, the royal phase in the 13th to early 14th centuries, was a phase of military occupation that saw the dismantling and transformation of the castrum into a royal fortress (Maso *et al.* 2004).

### Material and methods

Zooarchaeological analyses were conducted by Audrey Roussel and Dianne Unsain. They were associated with samplings for chemical analyses (isotopic and proteomic), which are currently being analysed by our colleagues at the

University of York (dir. Alexander). The analysis of fisheries resources was carried out by Tatiana André, doctoral student at LA3M (CNRS, UMR 7298).

### Material

The three sites in the corpus provided a very large quantity of faunal material. Sampling was therefore necessary to meet the time constraints of this study. Assemblages were selected on the basis of available stratigraphic data, focusing on well-contextualised, undisturbed layers. The sample consists of 9559 faunal remains (Table 14.1). More than half came from Saint-Pierre castle, Fenouillet (5581 remains, or 58% of the NR). On this site, the remains come mostly from the early royal period (44%). The feudal period is represented by 32%, while the royal phase represents 23% of the site's material. The second site with the most material was Le Castellat, Montailou, with 3023 remains (32% of the NR). Here, the royal period is largely dominant, with 64% of the site's material (NR = 1925). It is followed by the feudal period (22%, 671 remains) and the late Middle Ages (14%, 427 remains). Lastly, the royal period of Peyrepertuse castle



Table 14.1. Presentation of the faunal assemblage studied by site and settlement. NR = Number of remains, NRDa = Number of anatomically determined remains, NISP = Number of identified specimens, ND = Not identifiable

| Period                                                | Chronology                 | NR           | %NR        | NRDa         | %NRDa      | NISP         | %NISP      | ND           | %ND        |
|-------------------------------------------------------|----------------------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|
| <b>LE CASTELLAS MONTAILLOU</b>                        |                            |              |            |              |            |              |            |              |            |
| <b>Feudal period</b>                                  | 1st half 13th C.           | 671          | 22%        | 209          | 31%        | 233          | 35%        | 229          | 34%        |
| <b>Royal period</b>                                   | 2nd half/end 13th C.       | 1,925        | 64%        | 588          | 31%        | 631          | 33%        | 706          | 37%        |
| <b>Late Middle Ages -<br/>Modern period</b>           | 14th -15th C.              | 427          | 14%        | 86           | 20%        | 141          | 33%        | 200          | 47%        |
| <b>Subtotal</b>                                       |                            | <b>3,023</b> | <b>32%</b> | <b>883</b>   | <b>29%</b> | <b>1,005</b> | <b>33%</b> | <b>1,135</b> | <b>38%</b> |
| <b>PEYREPERTUSE CASTLE, DUILHAC-SOUS-PEYREPERTUSE</b> |                            |              |            |              |            |              |            |              |            |
| <b>Royal period</b>                                   | Late 13th - late 14th C.   | 955          | 100%       | 446          | 47%        | 347          | 36%        | 162          | 17%        |
| <b>Subtotal</b>                                       |                            | <b>955</b>   | <b>10%</b> | <b>446</b>   | <b>47%</b> | <b>347</b>   | <b>36%</b> | <b>162</b>   | <b>17%</b> |
| <b>SAINT-PIERRE CASTLE, FENOUILLET</b>                |                            |              |            |              |            |              |            |              |            |
| <b>Feudal period</b>                                  | Late 12th-1st half 13th C. | 1799         | 32%        | 684          | 38%        | 647          | 36%        | 468          | 26%        |
| <b>Early royal period</b>                             | 2nd half 13th C.           | 2482         | 44%        | 627          | 25%        | 878          | 35%        | 977          | 39%        |
| <b>Royal period</b>                                   | Late 13th - early 14th C.  | 1300         | 23%        | 332          | 26%        | 466          | 36%        | 502          | 39%        |
| <b>Subtotal</b>                                       |                            | <b>5581</b>  | <b>58%</b> | <b>1643</b>  | <b>29%</b> | <b>1991</b>  | <b>36%</b> | <b>1947</b>  | <b>35%</b> |
| <b>TOTAL</b>                                          |                            | <b>9,559</b> |            | <b>2,972</b> | <b>31%</b> | <b>3,343</b> | <b>35%</b> | <b>3,244</b> | <b>34%</b> |

provided 10% of the material studied (955 remains). We note a higher rate of determination at Peyrepertuse, with the lowest rate of non-identifiable remains in the study (17% compared with an average of 34%). Conversely, the rate of taxonomically determinable elements is consistent across occupations, with an average of 35%.

## Methods

### Anatomical and taxonomic identification

Where possible, the name of the genus and species was given. However, due to fragmentation, a large number of remains could not be determined taxonomically. This is why: to avoid under-representation of species, material that can only be determined anatomically has been divided into three size classes. Small animals include some mammals (e.g. rodents or small carnivores), birds and aquatic animals. Medium-sized animals include pig, sheep, goat, roe deer and canids. Finally, large animals are made up of cattle, equids, red deer and bear.

The distinction between goats (*Capra hircus*) and sheep (*Ovis aries*) is based on the morphology of the lower jugal teeth (deciduous teeth: Zeder and Pilaar 2010; permanent teeth: Helmer 2000; Halstead *et al.* 2002; Gillis *et al.* 2011) and postcranial elements (Fernandez 2001; Zeder and Lapham 2010; Salvagno and Albarella 2017). No wild boar was identified on the basis of bone robusticity. It should be noted that the figures representing the skeletal distribution of suids are derived from the wild boar model,<sup>2</sup> as we consider that medieval pigs must have been morphologically closer to wild boar than to today's domestic pig (Poplin 1976). The distinction between rabbits and hares was not made in this

study, but for Saint-Pierre castle, the results of the previous study carried out by Forest (1999) have been used.

### Age assessment

Mortality age was estimated on the basis of eruption dates and stages of tooth wear. For caprines, these estimates are based on the work of Moran and O'Connor (1994) and Greenfield and Arnold (2008). For pigs, they are based on publications by Matschke (1967), Baubet *et al.* (1994) and Lemoine *et al.* (2014). For cattle, we relied on Jones and Sadler (2012). To address possible variations in the exploitation of young animal carcasses compared to adults, the epiphyseal stages of long bones were also used (Barone 1976).

### Quantifying the assemblages

Several quantification units are used in this study. The Number of Remains (NR) is calculated by adding all the remains provided by the sample, whether determined or undetermined (Brugal *et al.* 1994). The Number of Remains Anatomically Determinable (NRDa) is made up of elements determined only at anatomical level. A significant quantity of material falls into this category. Combined with the size classes of the species, this unit of quantification is used to balance out any anatomical under-representation within the species identified. The Number of Identified Specimens (NISP) corresponds to remains that have been determined both anatomically and taxonomically. Material that could not be determined is classified as non-determinable (ND).

The MNE corresponds to the Minimum Number of Anatomical Elements of a taxon, regardless of age, sex and

laterality (Brugal *et al.* 1994). For greater accuracy in the skeletal representations of the main species represented, the MNE of long bones (and the resulting calculations such as the MAU and MNI) was calculated by bone portion: proximal and distal ends, proximal, medial and distal diaphyses. The Minimum Number of Individuals (MNI) is calculated for each taxon. The MNI by frequency (MNI<sub>f</sub>) considers only the laterality of the bones, while the MNI by combination (MNI<sub>c</sub>) integrates other determining factors such as age, size and sex (Brugal *et al.* 1994). These two variants have been used. The Minimum Animal Unit was developed by Binford (Binford 1978; Brugal *et al.* 1994) and is used to address strategies for the acquisition, processing and consumption of meat resources. It is calculated for each anatomical part by dividing the MNE by the frequency of the element within a species (called Quantified SPecimen, or QSP).<sup>3</sup> The MAU is often standardised by taking into account the largest MAU, equal to 100% (% survival). This unit limits bias due to fracturing, but also corrects for the over-representation of certain anatomical elements such as vertebrae or ribs. The formulas used for the calculation are as follows:  $MAU = MNE / QSP$  and  $MAU\% = 100 * MAU / MAU \text{ maximum}$ . The MAU was used for skeletal profiles whenever the material from a taxon allowed it (NISP > 100). For taxa with fewer than 100 remains, the non-derived NISP was preferred.

Due to time constraints and considering the abundance of material to be processed, we focused on dental and appendicular material. The axial skeleton (vertebrae and ribs), which is very abundant but also much more fragmented than the other elements, has only been quantified by anatomical rank in the case of the most abundant taxa (caprines and suids) and classified as coming from medium-sized animals. Only the least prone to fragmentation and most diagnostic elements (atlas, axis and sacrum) were identified to species level for these taxa. Recognizing this bias in the study, we have chosen to express the skeletal frequencies of this class in NISP% (Number of Identified Specimens).

### Traceology

Traces of anthropic activity are evident from bone fracturing (Villa and Mahieu 1991; Lyman 1994) and from traceology. The nature of the traces observed (e.g. cut marks, blunt and sharp blows), their number, orientation and position were inventoried. Their interpretation is based on works such as those by Audoin-Rouzeau (1986), Dumont (1987), Lignereux and Peters (1996), Oueslati (2005) and Chong (2011).

### Density and utility indices

Statistical analyses were carried out when the NISP of a taxon was higher than 100. The first aim was to assess the impact of the natural conservation of the bone remains in relation with their mineral density. The second was to determine whether the most nutritious cuts were favoured and whether some resources were particularly targeted (meat, fat or marrow).

To do this, the relative frequency of Minimum Animal Units (MAU%) of the different skeletal parts<sup>4</sup> was confronted with their density indices (Lyman 1994; Ioannidou 2003) and their nutritional intake. For caprines, it was meat (including the associated fat), bone fat and bone marrow indices as well as the Modified General Utility Index (MGUI) which is a combination of the three (Lyman 1994). For pig, we used only the standardized Food Utility Index (sFUI), which is a close variant of MGUI (Rowley-Conwy *et al.* 2012).

Using Spearman's rank correlation test, these various indices can be used to determine whether a relationship exists between the density or the nutritional intake of anatomical parts and their representation within a bone assemblage. The risk threshold for validating the hypothesis is set at 0.05 (or 95% likelihood), as is accepted in studies validating a significant statistic. We propose as a null hypothesis ( $H_0, p \leq 0.05$ ) the absence of significance in the relationship between MAU% and bone density or utility. If  $H_0$  is rejected, then the alternative hypothesis  $H_1$  is validated, indicative of a significant correlation.

## Zooarchaeological results

### Le Castellat

#### Taxonomic diversity

##### FEUDAL PERIOD, FIRST HALF OF THE 13TH CENTURY

During the first half of the 13th century, the faunal remains analysed were divided between outdoor circulation areas (36%), the elite house (35%) and the subordinate house (29%). Of the 671 remains processed, 31% were determined only anatomically, 35% anatomically and taxonomically (NISP) and 34% could not be identified (Table 14.1).

The zooarchaeological study identified ten taxa, almost exclusively domestic. Caprines (*Ovis aries* and *Capra hircus*) provided the highest NISP for the period (NISP = 90, or 38.7% of the material). Pigs (*Sus scrofa domesticus*) accounted for 30%, while cattle (*Bos taurus*) accounted for 26.2% of the total NISP (Table 14.2). The spatial distribution of these species varies slightly, particularly in the subordinate house where, exceptionally, cattle have similar proportions to caprines (34 and 33 remains respectively). Cats (*Felis catus*) yielded three remains, while lagomorphs (rabbits/*Oryctolagus cuniculus* and hares/*Lepus europaeus*) as well as hens (*Gallus gallus domesticus*) each yielded two remains. Finally, dogs (*Canis lupus familiaris*) and equids (horse/*Equus caballus*; donkey/*Equus asinus* and their hybrids) are represented by single remains. It should also be noted that lagomorphs are found only in the elite house, while the equidae remain come from the subordinate house.

##### ROYAL PERIOD, SECOND HALF OF THE 13TH CENTURY

The next period, corresponding to the second half of the 13th century, yielded 64% of the material studied on the

Table 14.2. Taxonomic distribution of faunal remains from all sites and settlements expressed in NISP and NISP%

| Scientific name            | Common name | LE CASTELLAS  |       |              |       |                  |       | PEYREPER-TUSE CASTLE |       |              |       | SAINT-PIERRE CASTLE |       |                    |       |              |       |       |       |
|----------------------------|-------------|---------------|-------|--------------|-------|------------------|-------|----------------------|-------|--------------|-------|---------------------|-------|--------------------|-------|--------------|-------|-------|-------|
|                            |             | Feodal period |       | Royal period |       | Late Middle Ages |       | Total                |       | Royal period |       | Feodal period       |       | Early Royal period |       | Royal period |       | Total |       |
|                            |             | NISP          | %NISP | NISP         | %NISP | NISP             | %NISP | NISP                 | %NISP | NISP         | %NISP | NISP                | %NISP | NISP               | %NISP | NISP         | %NISP | NISP  | %NISP |
| Domestic mammals           |             |               |       |              |       |                  |       |                      |       |              |       |                     |       |                    |       |              |       |       |       |
| <i>Bos taurus</i>          | Cattle      | 61            | 26.2% | 80           | 12.7% | 23               | 16.3% | 164                  | 16.3% | 10           | 2.9%  | 101                 | 15.6% | 338                | 38.5% | 66           | 14.2% | 505   | 25.4% |
| Caprinae                   | Caprines    | 81            | 34.8% | 246          | 39.0% | 78               | 55.3% | 405                  | 40.3% | 171          | 49.3% | 240                 | 37.1% | 290                | 33.0% | 223          | 47.9% | 753   | 37.8% |
| <i>Ovis aries</i>          | Sheep       | 7             | 3.0%  | 9            | 1.4%  | 2                | 1.4%  | 18                   | 1.8%  | 15           | 4.3%  | 37                  | 5.7%  | 16                 | 1.8%  | 6            | 1.3%  | 59    | 3.0%  |
| <i>Capra hircus</i>        | Goat        | 2             | 0.9%  | 16           | 2.5%  | 4                | 2.8%  | 22                   | 2.2%  | 10           | 2.9%  | 35                  | 5.4%  | 12                 | 1.4%  | 8            | 1.7%  | 55    | 2.8%  |
| <i>Sus scrofa dom.</i>     | Pig         | 70            | 30.0% | 199          | 31.5% | 26               | 18.4% | 295                  | 29.4% | 43           | 12.4% | 151                 | 23.3% | 129                | 14.7% | 106          | 22.7% | 386   | 19.4% |
| Equidae                    | Equids      | 1             | 0.4%  | 13           | 2.1%  | -                | -     | 14                   | 1.4%  | -            | -     | -                   | -     | -                  | -     | -            | -     | -     | -     |
| <i>Felis catus</i>         | Cat         | 3             | 1.3%  | 2            | 0.3%  | -                | -     | 5                    | 0.5%  | -            | -     | -                   | -     | -                  | -     | -            | -     | -     | -     |
| <i>Canis lupus fam.</i>    | Dog         | 1             | 0.4%  | 1            | 0.2%  | 1                | 0.7%  | 3                    | 0.3%  | -            | -     | 1                   | 0.2%  | -                  | -     | -            | -     | 1     | 0.1%  |
| Wild mammals               |             |               |       |              |       |                  |       |                      |       |              |       |                     |       |                    |       |              |       |       |       |
| <i>Cervus elaphus</i>      | Red deer    | -             | -     | 1            | 0.2%  | -                | -     | 1                    | 0.1%  | 1            | 0.3%  | -                   | -     | 10                 | 1.1%  | 4            | 0.9%  | 14    | 0.7%  |
| <i>Capreolus capreolus</i> | Roe deer    | -             | -     | -            | -     | 1                | 0.7%  | 1                    | 0.1%  | -            | -     | 1                   | 0.2%  | 1                  | 0.1%  | -            | -     | 2     | 0.1%  |
| <i>Ursus arctos</i>        | Bear        | -             | -     | 1            | 0.2%  | -                | -     | 1                    | 0.1%  | -            | -     | 3                   | 0.5%  | -                  | -     | 9            | 1.9%  | 12    | 0.6%  |
| <i>Vulpes vulpes</i>       | Fox         | -             | -     | 1            | 0.2%  | -                | -     | 1                    | 0.1%  | -            | -     | -                   | -     | -                  | -     | -            | -     | -     | -     |
| Lagomorpha                 | Lagomorph   | 2             | 0.9%  | 3            | 0.5%  | -                | -     | 5                    | 0.5%  | 7            | 2.0%  | 4                   | 0.6%  | 7                  | 0.8%  | 7            | 1.5%  | 18    | 0.9%  |
| Microfauna                 | Microfauna  | -             | -     | -            | -     | -                | -     | -                    | -     | 1            | 0.3%  | 1                   | 0.2%  | 3                  | 0.3%  | -            | -     | 4     | 0.2%  |
| <i>Rattus sp.</i>          | rat         | -             | -     | 3            | 0.5%  | -                | -     | 3                    | 0.3%  | -            | -     | 17                  | 2.6%  | 1                  | 0.1%  | -            | -     | 18    | 0.9%  |
| Human                      | Human       | -             | -     | -            | -     | -                | -     | -                    | -     | -            | -     | -                   | -     | -                  | -     | -            | -     | -     | -     |
| <i>Homo sapiens</i>        | Human       | -             | -     | 12           | 1.9%  | -                | -     | 12                   | 1.2%  | -            | -     | -                   | -     | -                  | -     | -            | -     | -     | -     |

(Continued)



Table 14.2. (Continued)

|                           |             | LE CASTELLAS  |       |              |       | PEYREPER-TUSE CASTLE |       |             |       | SAINT-PIERRE CASTLE |       |               |       |                    |       |              |       |             |       |
|---------------------------|-------------|---------------|-------|--------------|-------|----------------------|-------|-------------|-------|---------------------|-------|---------------|-------|--------------------|-------|--------------|-------|-------------|-------|
| Scientific name           | Common name | Feodal period |       | Royal period |       | Late Middle Ages     |       | Total       |       | Royal period        |       | Feodal period |       | Early Royal period |       | Royal period |       | Total       |       |
|                           |             | NISP          | %NISP | NISP         | %NISP | NISP                 | %NISP | NISP        | %NISP | NISP                | %NISP | NISP          | %NISP | NISP               | %NISP | NISP         | %NISP | NISP        | %NISP |
| <i>Birds</i>              |             |               |       |              |       |                      |       |             |       |                     |       |               |       |                    |       |              |       |             |       |
| <i>Aves</i>               | Avifauna    | 3             | 1.3%  | 14           | 2.2%  | -                    | -     | 17          | 1.7%  | 24                  | 6.9%  | 24            | 3.7%  | 27                 | 3.1%  | 10           | 2.1%  | 61          | 3.1%  |
| <i>Gallus gallus dom.</i> | Hen         | 2             | 0.9%  | 30           | 4.8%  | 6                    | 4.3%  | 38          | 3.8%  | 40                  | 11.5% | 26            | 4.0%  | 35                 | 4.0%  | 25           | 5.4%  | 86          | 4.3%  |
| <i>Anser anser</i>        | Goose       | -             | -     | -            | -     | -                    | -     | -           | -     | -                   | -     | 6             | 0.9%  | 4                  | 0.5%  | 1            | 0.2%  | 11          | 0.6%  |
| <i>Anas sp.</i>           | Duck        | -             | -     | -            | -     | -                    | -     | -           | -     | -                   | -     | -             | -     | 1                  | 0.1%  | -            | -     | 1           | 0.1%  |
| <i>Aquatic ressources</i> |             |               |       |              |       |                      |       |             |       |                     |       |               |       |                    |       |              |       |             |       |
| <i>Ichtyus</i>            | Fish        | -             | -     | -            | -     | -                    | -     | -           | -     | 25                  | 7.2%  | -             | -     | -                  | -     | -            | -     | -           | -     |
| <i>Malaco-fauna</i>       | Shells      | -             | -     | -            | -     | -                    | -     | -           | -     | -                   | -     | -             | -     | 4                  | 0.5%  | 1            | 0.2%  | 5           | 0.3%  |
| <b>Total</b>              |             | <b>233</b>    |       | <b>631</b>   |       | <b>141</b>           |       | <b>1005</b> |       | <b>347</b>          |       | <b>647</b>    |       | <b>878</b>         |       | <b>466</b>   |       | <b>1991</b> |       |

site. Of the remains analysed, 97% came from circulation areas (the buildings from the earlier phase having been destroyed). The remaining 3% (84 remains) came from a silo in the north-east corner of the platform, near the rampart. Determination rates were similar to the previous phase, with about 31% of remains determined anatomically, 33% identified anatomically and taxonomically, and 37% of remains undetermined.

The royal period presents the most diverse faunal list on the site, with 15 taxa, both domestic and wild. As in the feudal period, caprines dominate the assemblage, accounting for nearly 43% of the NISP (Table 14.2). They are followed by pigs, with 31.5%. Cattle come next, in proportions lower than those observed in the previous phase, at 12.7%. Chickens accounted for 4.8% of NISP (i.e. 30 remains), while equidae, unidentified birds and humans each provided around 2% of NISP. Cat, dog, red deer (*Cervus elaphus*), bear (*Ursus arctos*), fox (*Vulpes vulpes*), lagomorphs and rat (*Ratus* sp.) all provided between one and three remains, accounting for a total of 2% of the NISP.

#### LATE MIDDLE AGES, 14TH–15TH CENTURY

Few remains dating from the late Middle Ages have been analysed (14% of the site). All came from circulation areas. Eight taxa were identified (Table 14.2). The dominance of caprines in the assemblage is even more marked than in previous phases, with c. 60% of the NISP. Pigs and cattle are represented in similar proportions, with 18.4% and 16.3% of the NISP respectively. Chickens come next, with 4.3% of the NISP. Dogs and roe deer (*Capreolus capreolus*) each provided an element.

#### Cattle

##### SKELETAL REPRESENTATIONS

In the feudal period, cattle (NISP = 61) are mainly represented by cranial remains (Fig. 14.2, top). The thorax (vertebrae and ribs) is virtually absent, with only one rib fragment identified. This anatomical part is also largely under-represented among the remains of large animals that have not been determined taxonomically and that could have come from bovine. This category includes one atlas, one thoracic vertebra, six rib fragments (MNE = 1) and three caudal vertebrae. The other skeletal parts of the cattle are sporadically preserved, some being relatively fleshy (lower shoulder, rump and hocks), others, on the contrary, very poor in meat, such as the feet (only the phalanges).

During the royal phase (NISP = 80; Fig. 14.2, centre), the feet (this time metapodia and phalanges) represent the best represented anatomical part (MNE = 5). Apart from the thorax and most of the humerus and radius, which are absent from this phase, the entire skeleton is preserved, albeit in small proportions. The remains of large, unidentified animals that may have come from cattle correspond only to the thorax. These are mainly ribs (NISP = 49,

MNE = 4). Vertebrae, on the other hand, are very rare (NISP = 11), with one cervical, two thoracic and one lumbar vertebra.

At the end of the Middle Ages, the skeletal representation of cattle was still very fragmentary (NISP = 23; Fig. 14.2, bottom). A single fragment of humerus, radius, femur and tibia have been identified. The scapular and pelvic girdles and the lower legs (metapodia and phalanges) are present. As in previous phases, the thorax, and in particular the vertebrae, are very poorly preserved, even in remains that have not been determined taxonomically.

#### DEMOGRAPHY

In the feudal period, five cattle were identified from dental material. All age groups were represented by an individual, with the exception of very old individuals, which were absent (Fig. 14.3). During the next period, ten cattle were identified. All ages were represented, with one to two individuals each. At the end of the Middle Ages, four animals were identified, with one from each age group, except for the youngest and oldest animals, which were absent.

#### BUTCHERY

Few traces of partitioning have been observed in cattle. In the feudal period, there were a few fractures on long bones, caused by percussion with a blunt object. The only use of a cleaver was observed on the proximal end of a radius. During the royal period, marks were more frequent and the use of cleavers became more regular. Knife marks can be seen on elbows, ankles, hips and fingers. Knife marks are concentrated in the same places. The diaphyses of the long bones, which were rarely found, were opened by blunt percussion. At the end of the Middle Ages, percussion impacts were frequent, both on the long bones and on the mandible. On the other hand, there are very few traces of the cleaver: a mandibular symphysis cut and an axis tooth severed, perhaps when the head was separated.

#### Caprines

##### SKELETAL REPRESENTATIONS

During all phases, caprines dominate the assemblages. In the feudal period (NISP = 90), the skull and feet were in the majority (Fig. 14.4). The shoulder, saddle and shanks were also consumed. On the other hand, the thorax and leg are almost completely absent. Among the remains that have not been determined taxonomically, which correspond to medium-sized animals such as caprines, we find mainly rib and skull fragments, with vertebrae almost completely absent. In the royal period (NISP = 271), almost the entire skeleton is represented. As in the feudal period, however, the thorax is absent (partly compensated by the ribs that were not identified taxonomically) and the ends of the long bones are somewhat under-represented. At the end of the Middle Ages (NISP = 84), almost the entire skeleton is also

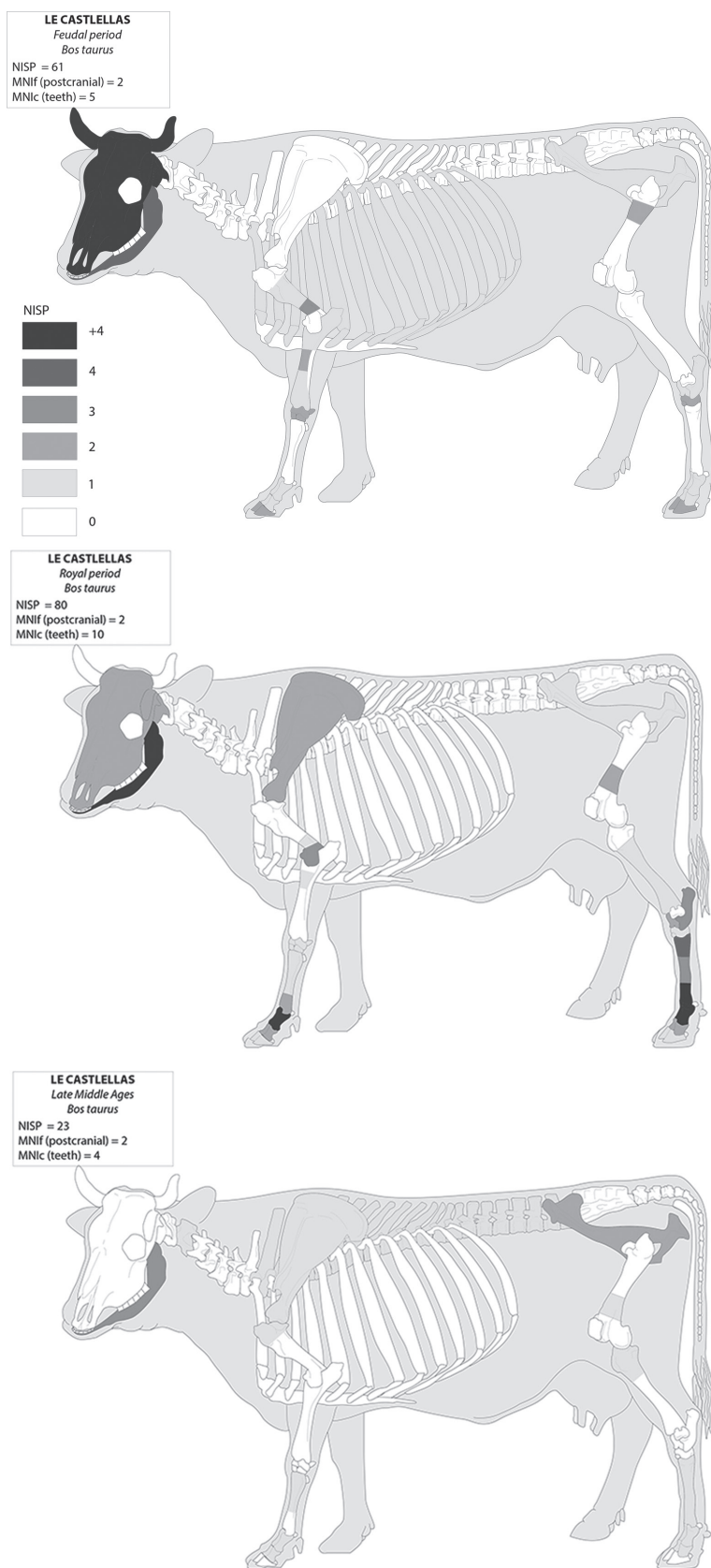


Fig. 14.2. Cattle skeletal profiles at Le Castellas, expressed in NISP%



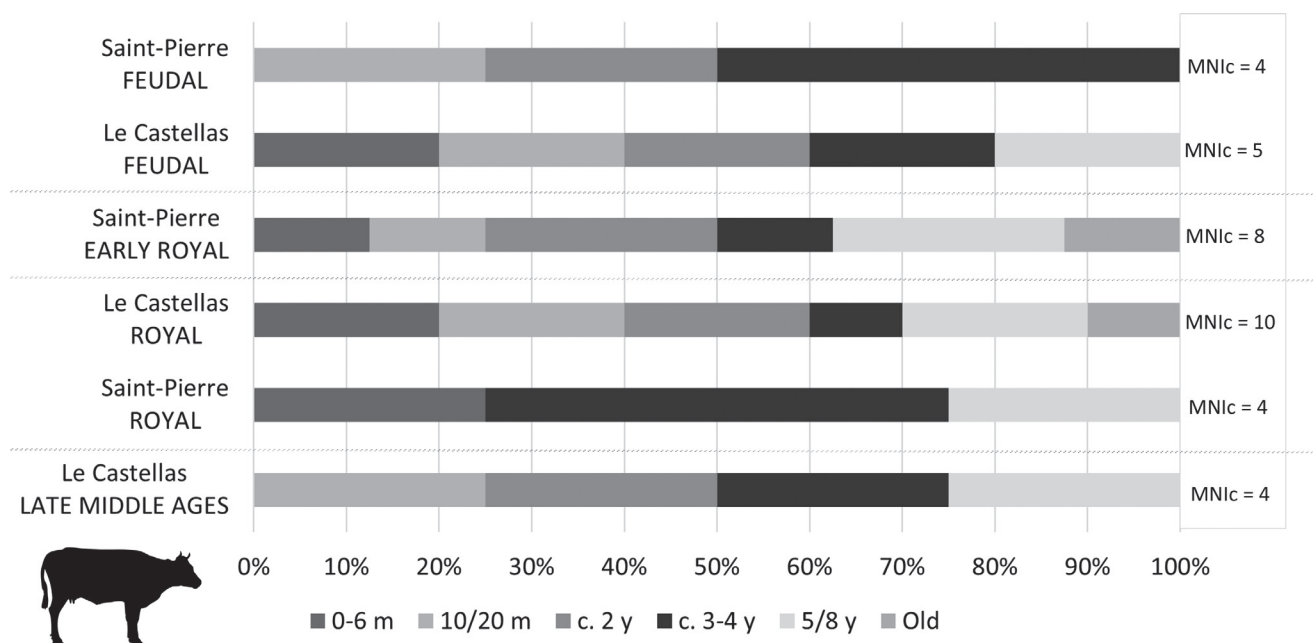


Fig. 14.3. Cattle mortality profiles in all settlements (MNIC%)

present, but in smaller proportions. However, the thorax is still missing.

For the royal period, the size of the corpus allowed evaluation of the conservation of the material in relation to its mineral density, and its meat, fat and bone marrow content. The only significant correlation identified by Spearman's rho is the relationship between the frequency of anatomical elements (MAU%) and their mineral density ( $p = 0.009$ ;  $\rho = 0.403$ ). The test indicates a moderate and positive correlation and reveals a substantial relationship. The densest elements tend to be the most frequent, such as the medial diaphysis of the radius and tibia. Conversely, low-density elements are often rarely observed, such as the atlas, axis and the proximal half of the diaphysis of the femur. In contrast, at first glance it would appear that nutrient intake did not play a major role in the composition of the sample. Indeed, whatever the animal resources tested, none were statistically correlated with the frequency of anatomical parts.<sup>5</sup> A more detailed reading, however, suggests greater complexity. For example, the tibia and metapodia show a relatively high frequency. Yet they are relatively low in meat and bone fat. In fact, they are the most marrow-rich elements in this taxon. The mandible and pelvis are the most common elements in the assemblage. These parts are not very rich in fat and marrow, but are moderately to very fleshy. The case of the femur is of particular interest: it is very poorly preserved but is nevertheless very rich in meat and provides a fairly good quantity of marrow and fat. In fact, it is the most profitable element when you consider the various resources it offers. Its absence is therefore puzzling.

#### DEMOGRAPHY

Caprines demographic profiles are very similar between the feudal and royal periods (Fig. 14.5). Half of the animals were consumed between their first months of life and their second year. The other half consisted of culled animals. The only notable difference is the absence of older animals during the feudal phase. At the end of the Middle Ages, the number of young animals diminished: no suckling lambs have been identified and 60% of the mutton originated from animals over three years old. It has been possible to distinguish between *Ovis* and *Capra* on a relatively limited number of elements, which means that it is not always possible to clearly identify the dominance of one species over the other, or to understand different herd management models. However, it seems that during the feudal period, sheep were in the majority, with four individuals for a young goat. In the royal period, five sheep and three goats of varying ages were identified, while in the late Middle Ages, one of each species was observed.

#### BUTCHERY

During the three periods, the dismemberment of caprines, unlike that of cattle, was almost exclusively carried out using blunt blows to open the diaphyses and gain access to the bone marrow and fat. Knife marks are very rare and the use of a cleaver has been identified on only two occasions in this taxon during the three phases. This type of trace is also absent from non-taxonomically determined elements from medium-sized animals.

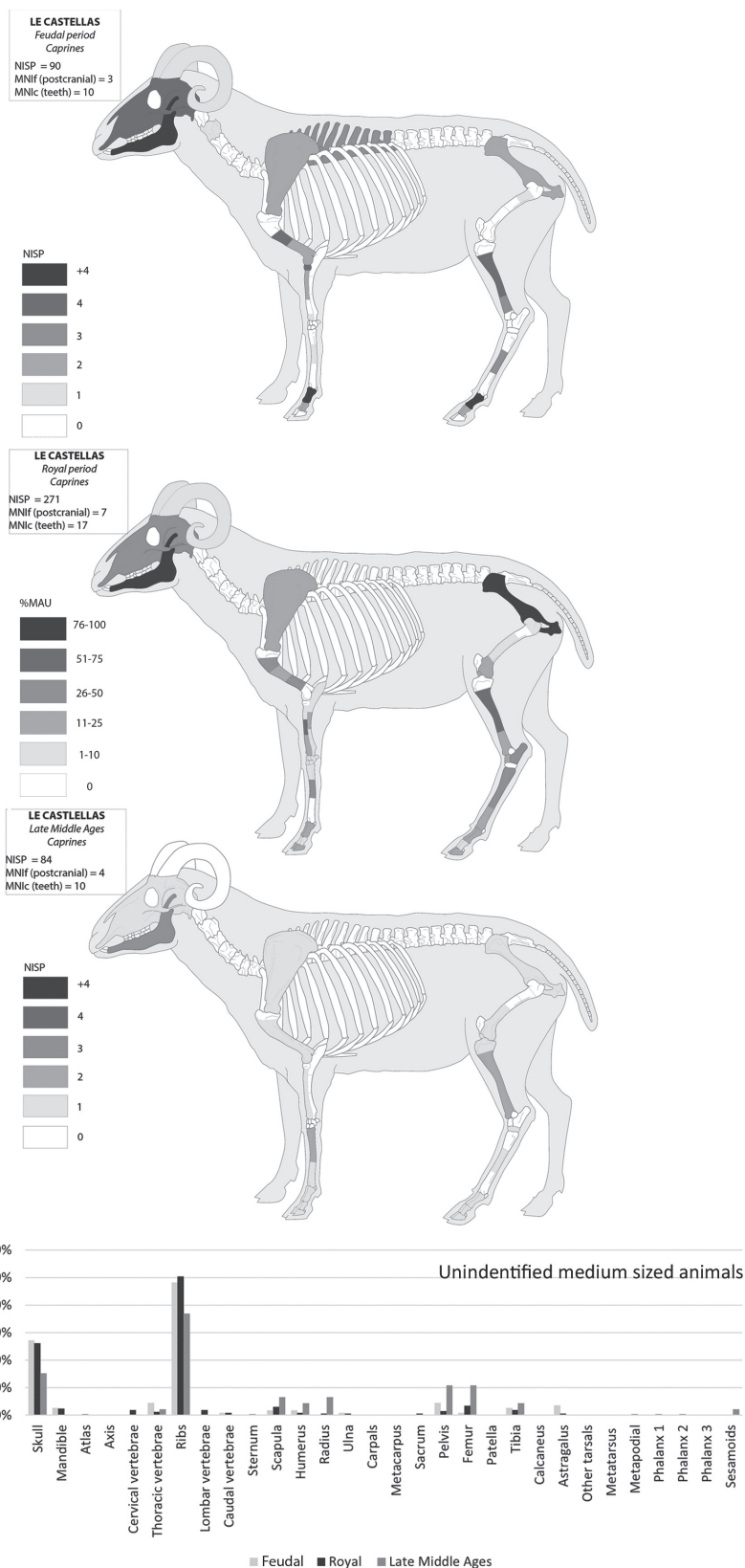


Fig. 14.4. Caprines skeletal profiles at Le Castellas, expressed in NISP% for feudal and late Middle Ages periods, and MAU% for the royal period. At the bottom, skeletal distribution of unidentified remains, medium sized animals remains (NISP%)

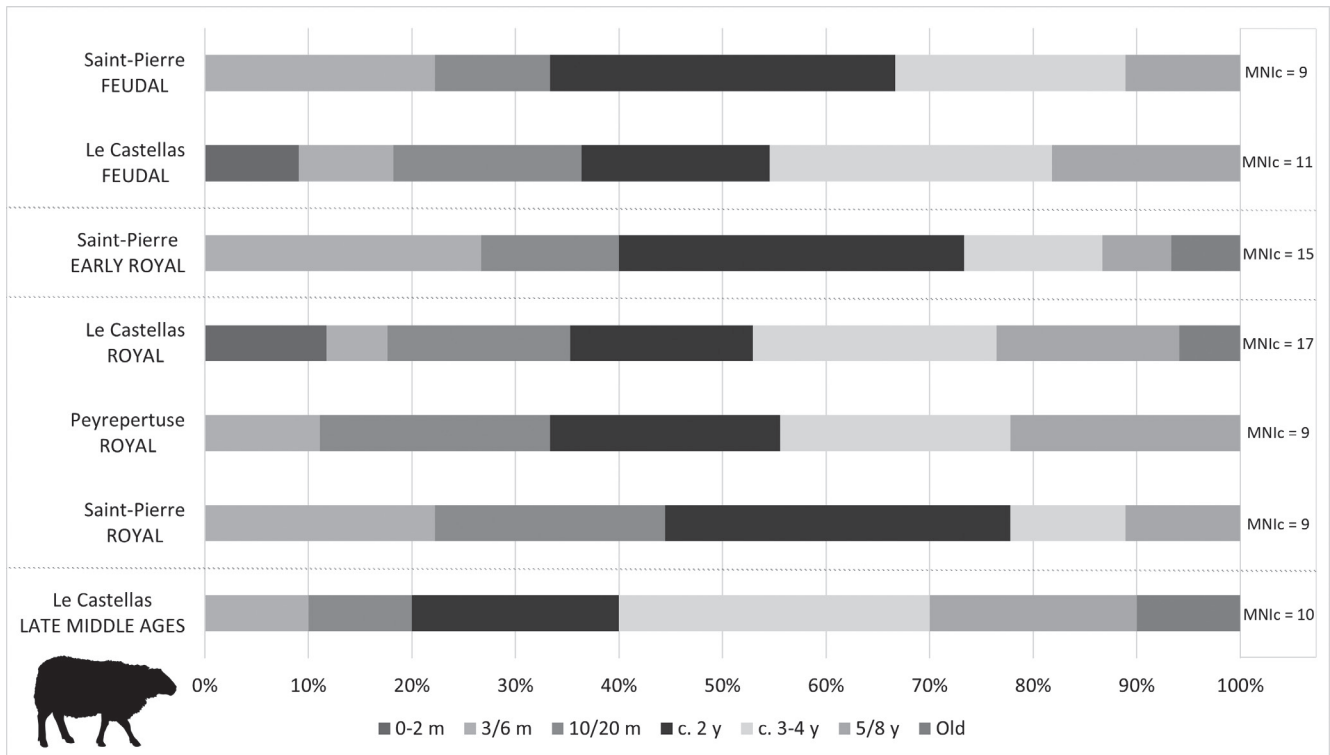


Fig. 14.5. Caprines mortality profiles in all settlements (MNIc%)

## Pigs

### SKELETAL REPRESENTATIONS

In general, pigs are the second most common species in terms of the number of remains. In the feudal period, they represented 30% of the NISP. The head is the most common element, followed by the shoulder (Fig. 14.6). The thigh and lower legs are also present, while the thorax and hocks are under-represented. During the royal period (31.5% of the NSIP), the femur disappeared completely from the assemblage. At the end of the Middle Ages, as the presence of pigs diminished (c. 18% of the NISP), only a few skull and shoulder remains were identified. As with caprines, vertebrae are rare, with a few atlases and axes depending on the phase. Very few vertebrae are also present in unidentified medium-sized animal remains. This is a recurring feature at the site. As with caprines, the quantity of pig remains associated with the royal period was used to statistically test the relationship between the frequency of anatomical parts on the one hand, and their mineral density and nutrient yield (sFUI) on the other. No significant correlation was found.<sup>6</sup>

### DEMOGRAPHY

Comparing demographic profiles over time is made delicate by the imbalance in head counts. In the feudal period (MNIc = 6), half of the individuals were consumed at the age of optimal fat yield, i.e. around two to three years of age (Blaise 2010). Despite this, the ages

identified are varied (Fig. 14.7). During the royal period (MNIc = 14), the young (up to one year old) are a little less present, the consumption concentrating on young adults who have reached their optimum yield, with almost 65% of the numbers. During the last phase (MNIc = 3), the three individuals identified were also young adults. The conservation of the material made it impossible to identify any wild boar.

### BUTCHERY

The treatment of pig carcasses has left few marks on the bones. As with caprines, these are essentially blunt fractures on the diaphyses of long bones. The use of cleavers, identified on a few occasions during the feudal period and at the end of the Middle Ages, was totally absent during the royal period, even though this was the phase when this taxon was most present (NISP = 199, MNI = 14). Knife marks are also virtually absent from this period, with only one case.

### Other species

Other taxa, both domestic and wild, complete the list of animals exploited by the site's inhabitants. The few equid remains identified come from the three periods: feudal (NISP = 1), royal (NISP = 13) and late Middle Ages (MNI = 1). During the latter period, based on the morphology of the teeth and humerus, the individual is likely to be an elderly donkey (Chuang and Bonhomme 2019). The remains come



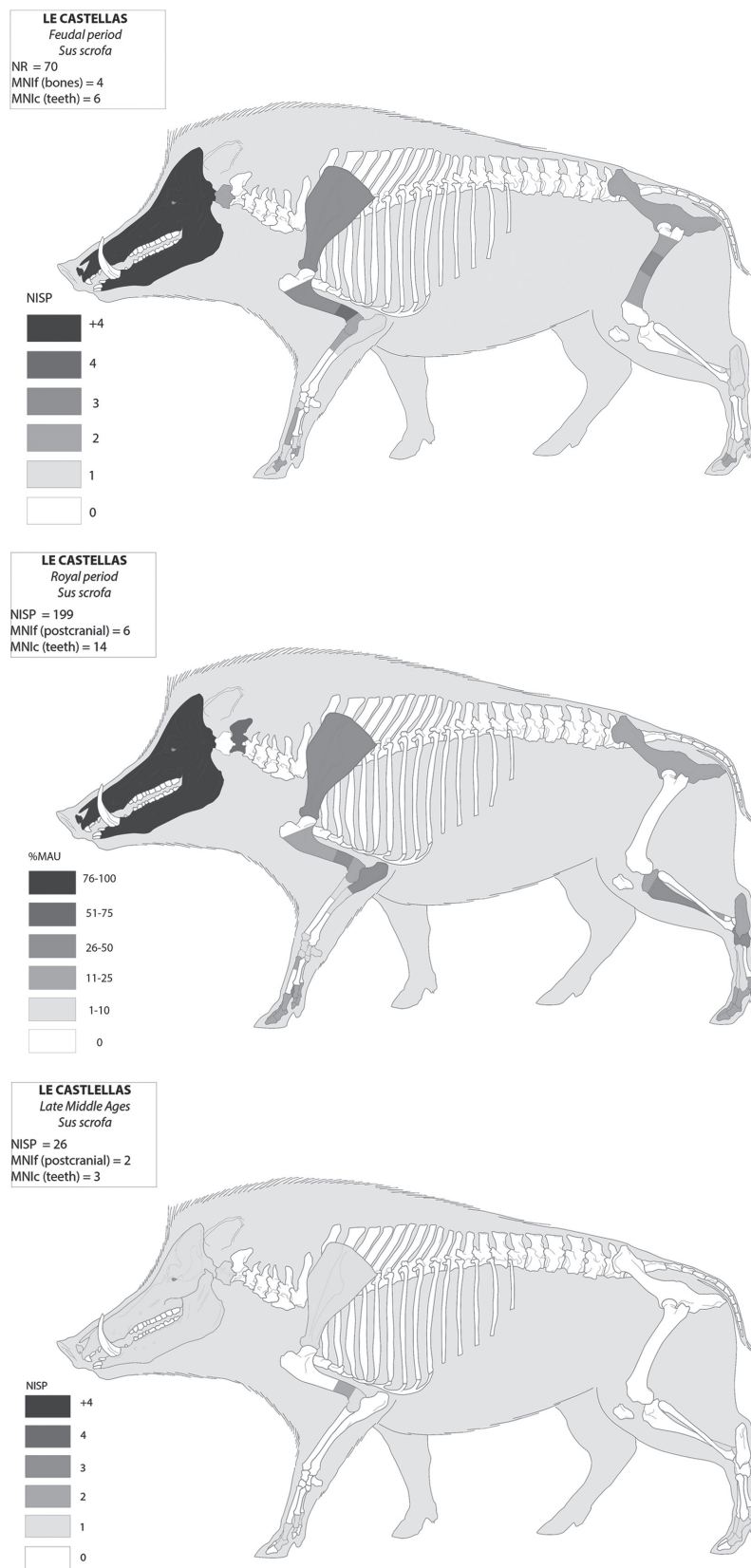


Fig. 14.6. Pig skeletal profiles at Le Castellat, expressed in NISP% for feudal and late Middle Ages periods, and MAU% for the royal period

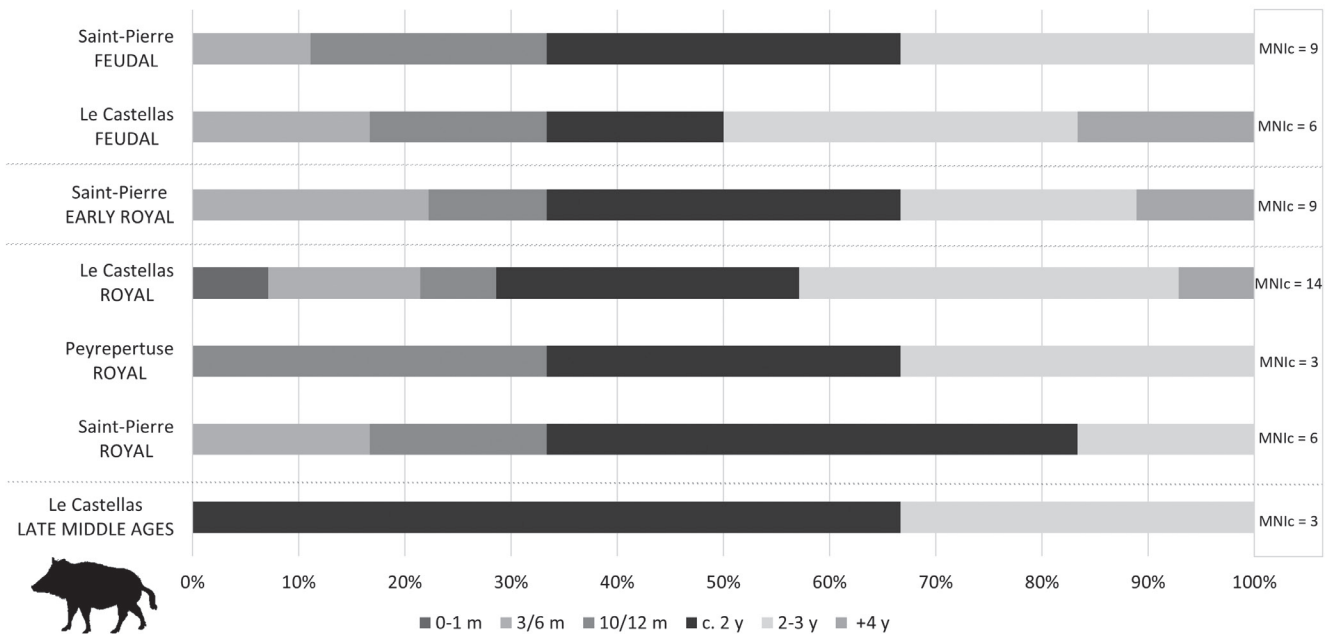


Fig. 14.7. Pig mortality profiles in all settlements (MNic%)

from various parts of the skeleton. No traces of human activity were identified on the bones. It should be mentioned here that a young equine skeleton was discovered in an anatomical connection at the bottom of the pit dug after the destruction of the corner house. However, this individual has not been analysed here.

Commensals, such as cats and dogs, are both present in almost all phases (MNI = 1), except for the last phase where cats are absent. These remains, which are very sporadic, systematically come from circulation areas. The dog from the feudal period was a puppy aged between ten and twelve months. The cat was an adult. It should also be noted that three rat remains (MNI = 1) have been identified from the royal period.

Large wild mammals are poorly represented. Absent from the feudal phase, they appeared in the next phase with the red deer (a fragment of a severed radius), brown bear (a third phalanx) and an adult fox (a mandible). At the end of the Middle Ages, the roe deer was the only large wild mammal, represented by a third lower premolar. Small mammals such as lagomorphs (rabbits and hares) were very rare. Two remains come from the elite house of the feudal period and three others from the royal period. There are very few birds on the site, mainly hens. Chickens were present during all the phases, and particularly during the royal period, when they accounted for the highest proportions (5% of the NISP). During this period, consumption focused on chicken thighs. The lower limbs yielded 22 remains, compared with seven for the front limb and one vertebra. There were at least six femurs and five tibias from, among others, a rooster and two hens during the laying period. The MNIC is 3.

### *Peyrepertuse castle: Terrestrial animals*

#### *Taxonomic diversity*

The faunal assemblage at Peyrepertuse castle comes mainly from the north-west underground room of the Sant Jordi keep, accounting for 74% of the material. The rest come from the quarry levels in the immediate vicinity of the building. The assemblage is dated to the royal period (late 13th–14th centuries). Caprines are the dominant taxon, accounting for c. 56% of the NISP (i.e. 196 remains, Table 14.2). Pigs and chickens are preserved in similar proportions, each representing about 12% of the NISP. Fish accounted for 7% of the material. Cattle are a minority at Peyrepertuse, with ten remains (2.9% of the NISP). Finally, lagomorphs and red deer accounted for 2% and less than 1% of the NISP respectively. It is interesting to note that most of the pig remains were found in the quarry (26 out of 43), while the fish (see below), lagomorph, red deer remains and most of the chicken bones came from the keep.

#### *Cattle*

The ten cattle remains identified consist of two teeth and articulated portions of two wrists found in the keep (distal end of radius and carpal bones, a fragment of metatarsal and a first phalanx). From the teeth and the fusion of the long bones, it was possible to identify three individuals: a calf less than two and a half years old (non-epiphyseal radius), an adult and an older adult.

Traces of human activity are visible on almost all six bones. The shin appears to have been isolated by cutting the distal diaphysis of the radius (one right) and the carpal

bones: once in the proximal row (right wrist), and once in the distal row (left wrist). The phalanx was split by a sharp blow to separate it from the metapodium, and longitudinal striations were made, possibly to remove the horn sheath from the claws.

### Caprines

#### SKELETAL REPRESENTATIONS

Caprines were the main source of meat during the royal period, accounting for 56% of the NISP (Table 14.2). If we consider that the majority of thorax remains in the medium-sized animal category come from caprines, it seems that the entire skeleton is preserved. However, the head, vertebrae and feet (metacarpus and phalanges) are less common. The material is not evenly distributed between the two areas studied. While all parts are present in the keep, with a preference for the fleshiest areas, the quarry contains mainly parts that are not very nutritious (Fig. 14.8).

As for the royal period at the Castellás, the quantity of material from caprines allowed testing the relationship between the frequency of skeletal elements and their density,

meat content, bone fat and marrow. However, the results differed from the previous site. No statistically significant correlation was identified with density ( $p = 0.305$ ;  $\rho = -0.166$ ). On the other hand, the relationship was extremely significant and positive for the Modified General Utility Index (MGUI,  $p = 0.000$ ;  $\rho = 0.649$ ) and more specifically for meat ( $p = 0.000$ ;  $\rho = 0.550$ ) and bone grease ( $p = 0.012$ ;  $\rho = 0.405$ ). These results are reflected in the strong presence of the shoulder and most especially the thigh, combined with a low frequency of the extremities of the legs.

#### DEMOGRAPHY

Nine caprines were identified, including three juveniles aged between three and twenty months, two young adults aged around two years, two slightly older ones (aged between three and four years) and two aged between five and eight years. The very young and the very old were completely absent. Few of these individuals could be identified with the species, with only two adult sheep and one adult goat.

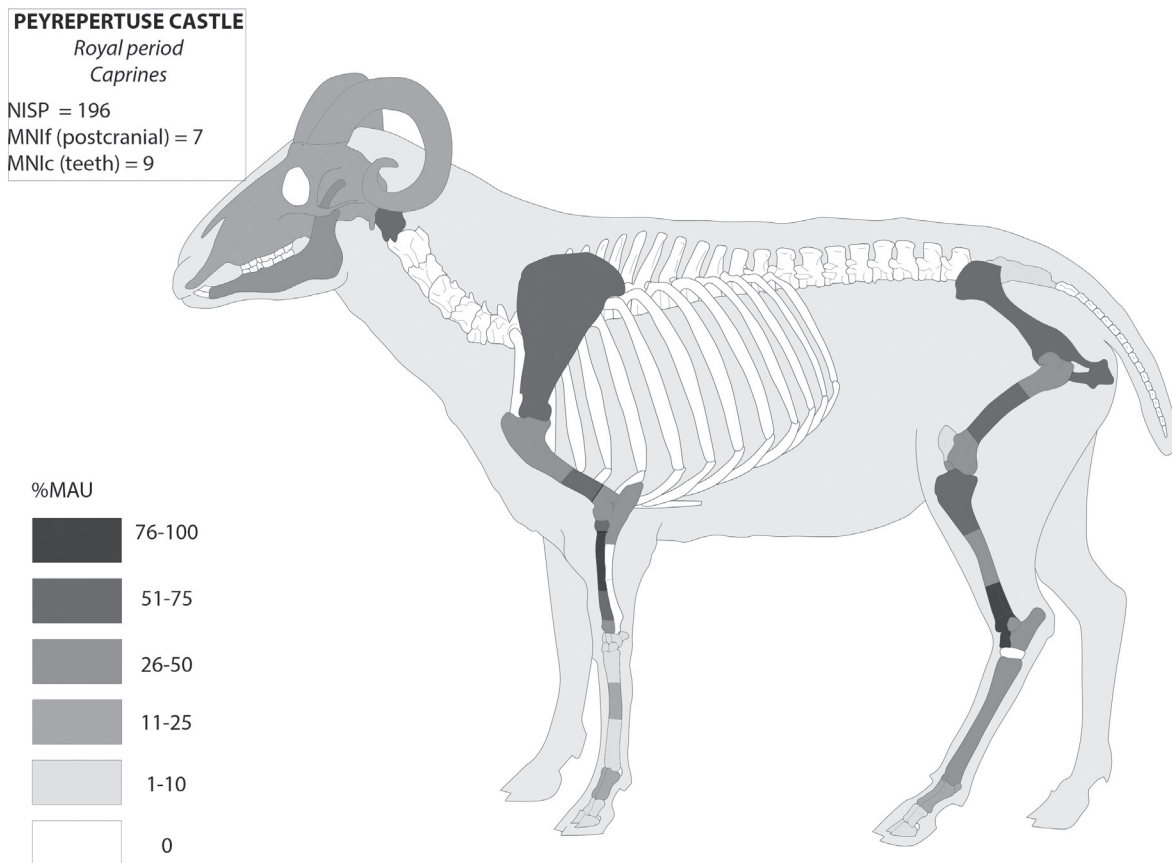


Fig. 14.8. Caprines skeletal profiles at Peyreperouse castle, expressed in MAU% for the royal period



## BUTCHERY

The butchering marks observed on the caprine bones at Peyrepertuse Castle (Fig. 14.9) are far more numerous than those at the Castellás, particularly during the royal period when the latter were almost non-existent. The scapula and the diaphyses of the long bones bear many impacts from blunt percussion. Opening the diaphyses allowed access to the nutrients contained in the medullary cavity. Slicing blows are visible on the atlas, suggesting that the neck was cut into two halves. The other vertebrae, which have not been specifically identified but are probably mainly related to caprines, are very often sliced down the middle, suggesting that the entire spine was prepared to produce two symmetrical half carcasses. The cleaver was also used on joints such as the elbow, hip and especially the knee, as well as to sever a horncore and part of the pelvis. Knife marks, which are fairly rare, are mainly associated with disarticulation. In only one case could they have resulted from the boning of the leg.

## Pig

Pigs accounted for c. 12% of the remains identified (NISP = 43). These are divided between the head and limbs, with a MNE generally between 1 and 2. Three individuals were identified from the teeth: a juvenile aged between ten and twelve months and two young adults aged between two and three years. Some traces of human activity were left when the carcasses were processed. As with caprines, blunt percussion marks on the long bones are associated with sharp blows on the flat bones and joints.

## Other terrestrial species

Very few other taxa were identified on the site. Amongst the mammals, a red deer stag antler base was found in the keep. Sliced, it appears to have been prepared for handicrafts. Lagomorph remains (MNI = 1) are also present in the keep, with parts of their heads, thighs and legs.

Bird remains are much more numerous, with 64 remains, 40 of which come from chicken. At least five individuals were counted, including two young birds, one of which was female, and three adults, including one female.<sup>7</sup>

## Peyrepertuse castle: Fish (by T. André)

### Introduction

At a time when archaeoichthyological studies are focusing mainly on the prehistoric, protohistoric and ancient periods in southern France, Peyrepertuse castle (13th century) is one of a series of medieval archaeoichthyological studies initiated by Tatiana André and continued in her doctoral thesis.<sup>8</sup> Integrated with the post-excavation analysis of the site, the study of bone material sheds new light on the acquisition and processing of marine resources inland, 32km from the Leucate/Salses lagoon and 40km from the Gulf of Lion. The biogeographical setting of the study is in the southern

part of the Corbières limestone massif, in what is now the Aude department, around 33km north-west of Perpignan, 43km south-east of Carcassonne and 50km south-west of Narbonne. The river Verdoube flows approximately 1350m north of the château, while the ruisseau de la Fontaine and the ruisseau de Riben are 750m and 1600m respectively to the south of the site.

### Material and method

The ichthyological material came from US 1009 [1], dating from the 13th to 14th centuries, in the underground room of the Sant Jordi keep. Collected by hand (Fig. 14.10, A), the 27 bones consist mainly of vertebrae (56%), with few bones and scales (Fig. 14.10, B). Identification was based on Tatiana André's comparative anatomy collection and reference works (Courtemanche and Legendre 1985; Cannon 1987; Rosello Izquierdo 1988).<sup>9</sup> Standardised measurements were taken on the vertebrae (Morales-Muñiz and Roselund 1979),<sup>10</sup> and when possible, fish mass and size were estimated according to published references (Sternberg 1992). Analysis of seasonality was not possible due to difficulties in reading the growth rings.

### Results

The following results reflect only a small part of the potential ichthyological spectrum of the site due to the absence of sieved sediments and the single US provided for this study. They do not allow a complete study to be carried out and will simply provide an overview of the question of fish at Peyrepertuse castle. The small number of remains means that it is not possible to discuss the restitution methods in all their detail, although these will be set out below by way of example. They do not in any way allow us to develop hypotheses concerning the choices made in harvesting stocks, the size choices favoured for consumption or trade, or even to deduce a fishing season.

Of the total number of remains collected (NRR) of 27, the number of anatomically determined remains (NRDa) of 25 includes bones of the 'bone' type (NR = 2). Without these, the NRDa is reduced to 23, of which 19 have been attributed to a taxon (NRDt) (Fig. 14.10, A). Despite the very low number of remains, the NRDt reflects a diverse taxonomic spectrum. For US 1009 alone, seven taxa, including four species, were identified (Fig. 14.10, C). These specimens are most often found in marine and brackish lagoon-type environments (Sternberg 1995; Kara and Quignard 2018; André forthcoming). Although a freshwater river borders the site, there are no freshwater species. This observation may be the result of a consumption pattern centred on seafood products, but it must be strongly qualified by the bias induced by the absence of sampling and sieving. In fact, it has been demonstrated at several other contemporaneous sites that certain individuals, such as trout and cyprinids, only appear in the taxonomic spectrum with the use of sieving, which

**PEYREPERTUSE CASTLE***Royal period**Caprines*

NISP = 196

MNIf (postcranial) = 7

MNlc (teeth) = 9

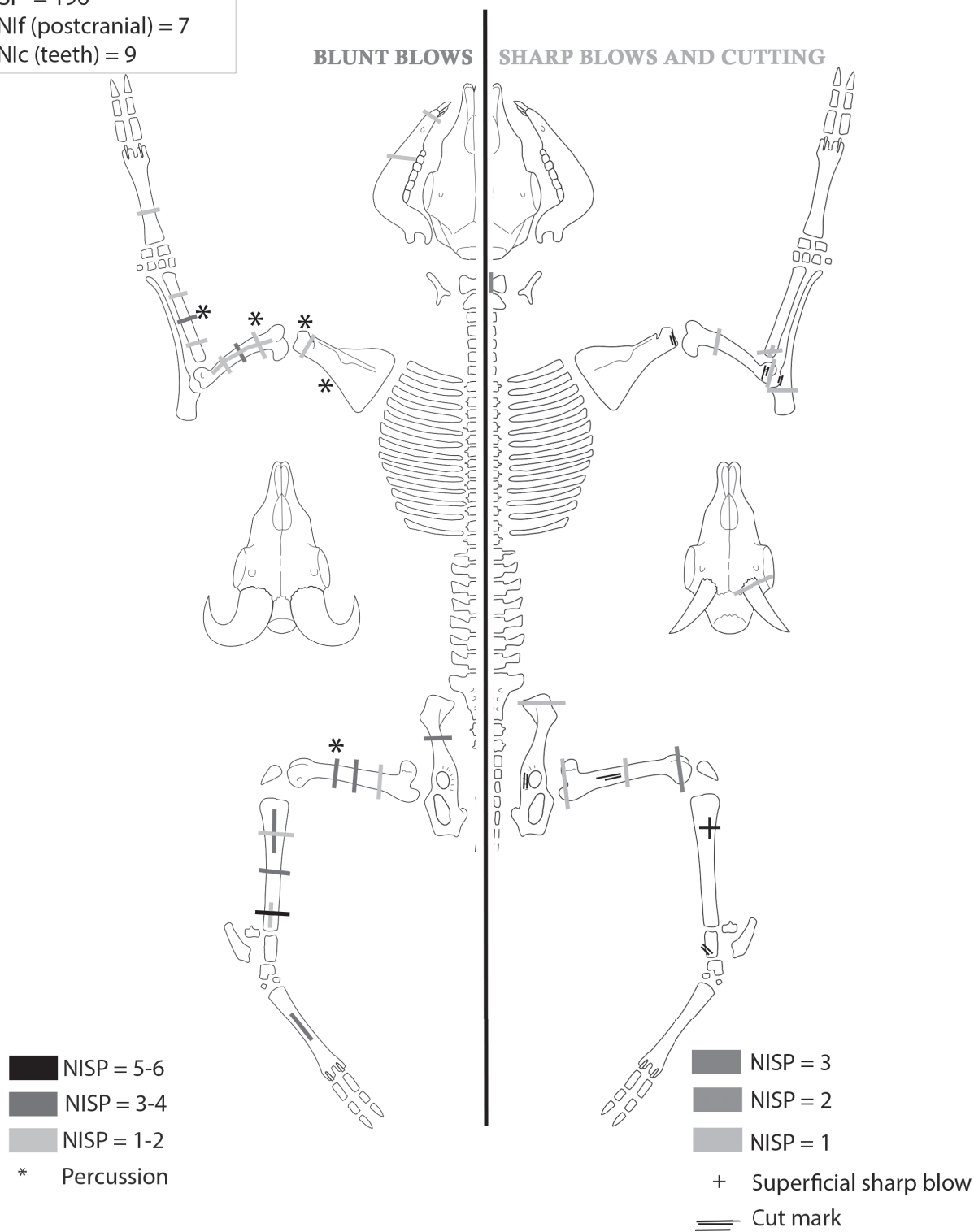
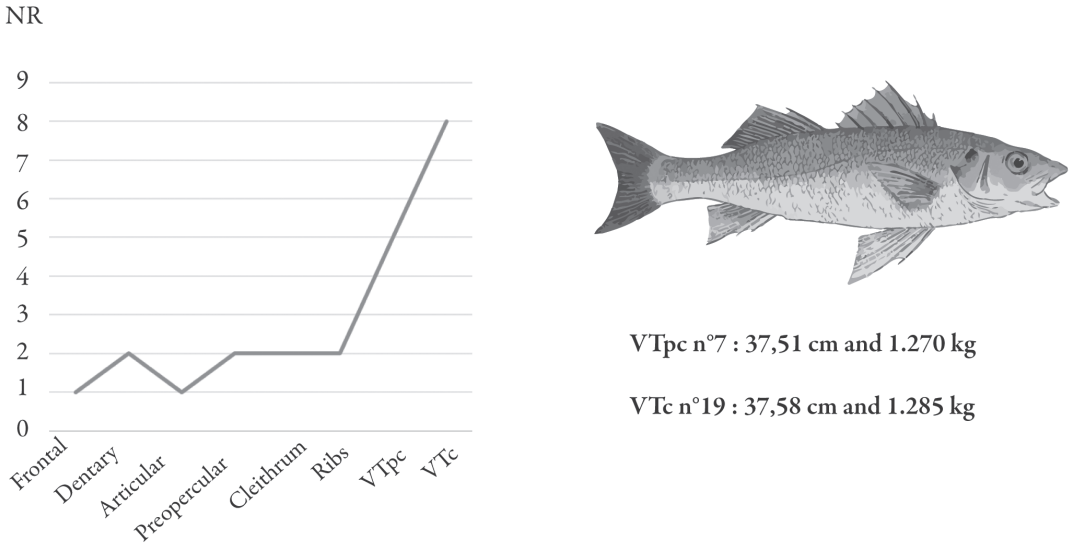


Fig. 14.9. Restitution of anthropic traces on caprines in Peyreperouse, royal period

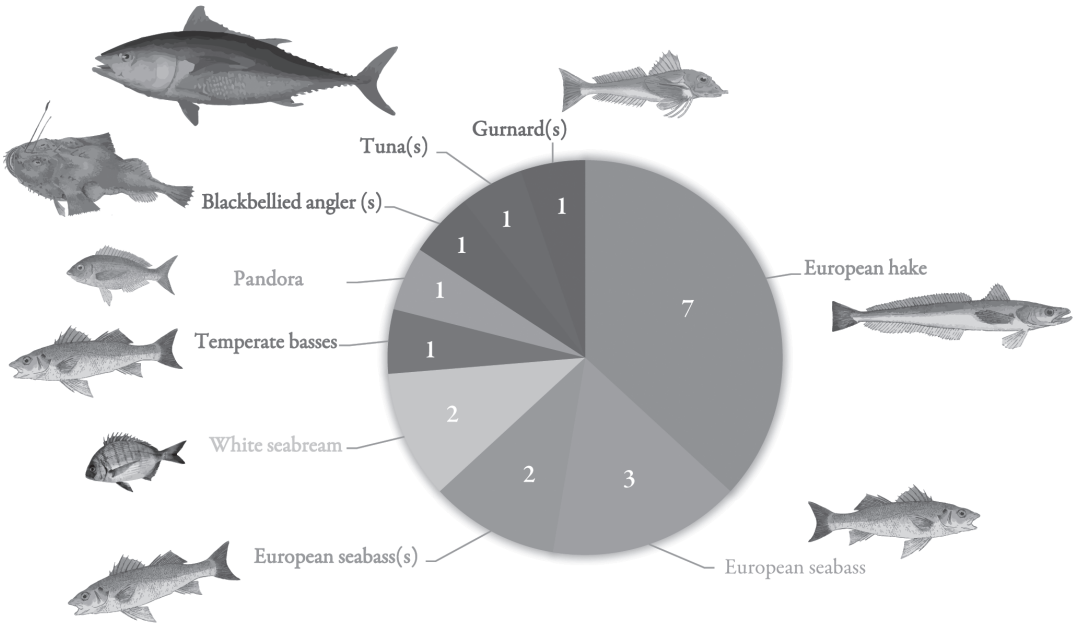
| US 1009 | NRR | NRDa | Fish bones | Fish scales | NRDaR | NRDt | IND |
|---------|-----|------|------------|-------------|-------|------|-----|
| Manual  | 27  | 25   | 2          |             | 23    | 19   | 2   |
| Sieving |     |      |            |             |       |      |     |
| Total   | 27  | 25   | 2          |             | 23    | 19   | 2   |

A. General distribution of ichthyological remains from the Peyrepertuses site.



B. Distribution of the different anatomical parts determined according to NRR = 27.

D. Restitution of the size and mass of European seabass (*Dicentrarchus labrax*) vertebrae according to Sternberg, 1992. DAO ANDRE.T



C. Distribution of the different taxa determined according to NRDt = 19 from NRR = 27. Fish names followed by 's' refer to the genus and not the species. DAO ANDRE.T

Fig. 14.10. Results of the archaeoichthyological study



we now know actually is essential for an accurate view of the taxa exploited (Sternberg 1995; Clavel 2001; Ephrem 2014; André 2022). The same applies to small euryhaline migrants such as anchovy and silversides.

#### *Taphonomy, butchery marks and osteometry*

Taphonomic and cut marks can be seen on some fragments (Table 14.3). An unidentifiable fragment shows knife marks and appears to have been sliced, as does a European sea bass cleithrum. The caudal vertebra of tuna shows advanced signs of vermiculation.

Osteometric measurements were carried out on all vertebrae and some bones in accordance with published references. However, due to the poor preservation of the remains and the conformity of the species to the available osteometry sheets, only a fraction of the total mass of the individuals captured could be estimated, i.e. European sea bass (*Dicentrarchus labrax*) vertebrae (Fig. 14.10, D). Using the MNI Global Spinal Profile (GSP) method, it appears that these two vertebrae belong to the same individual (Casteel 1976; Desse et al. 1989; Sternberg 1995; André forthcoming).

#### *Conclusion*

Despite its proximity to several watercourses, the sample studied appears to reflect exploitation of salty environments, both lagoonal and marine. The supply of fish to the castle seems to follow practices similar to those observed in Provence, but the current data do not allow us to explore other hypotheses in depth. The lack of sediment samples means that we cannot confirm a fishing strategy based solely on large specimens. At this stage in our understanding of the site, it is difficult to determine with any certainty the direct origin of the fish consumed. They could either have come from the fisheries of the local lords, as products of taxes and royalties, or have been purchased from tide boats or fishmongers, as was common in France in medieval and modern times.

In order to gain a better understanding of the strategies used to acquire, process and consume aquatic resources, it will be necessary to apply specific sampling and sieving protocols during future excavations on this or similar sites. The results obtained (André 2022, 2023a, 2023b, forthcoming) from these protocols (Sternberg 2017) demonstrate their crucial importance for the study of this type of archaeological material.

#### *Saint-Pierre castle*

##### *Taxonomic diversity*

FEUDAL PERIOD, END OF THE 12TH–FIRST HALF OF THE 13TH CENTURY

The feudal period yielded 1799 remains. Of these, 58% were found in the summit building and 43% in the vaulted room against the rampart. The identification rate is similar between the two areas, with an average of 36% identified taxonomically (NISP = 647).

Fourteen taxa, mainly domestic, have been identified during this phase (Table 14.2). Caprines were predominant, with 48% of the NISP. The remains that could be attributed to goat or sheep show equivalent proportions of each species (5.4% and 5.7% NISP of attributions respectively). They are followed by the pig, with 151 remains (23% NISP) and cattle with 101 remains (nearly 16% NISP). Avifauna is well represented (8.6% NISP), mainly chickens (NISP = 26; 4% NISP). Geese (*Anser* sp.) are also present, but in small numbers (6 remains; 0.9% NISP). Rats provided 17 remains (2.6% NISP), while dogs, red deer, bears and lagomorphs (more likely hare, according to Forest and Piques 1999) each accounted for less than 1% of the NISP.

While the presence of pigs is balanced between the two areas, the %NISP of caprines is almost three times higher in the summit building (62%) than in the vaulted room (almost 26%). Conversely, the %NISP of cattle is much higher in the vaulted room near the rampart (30.8%) than in the summit building (6.3%). It should also be noted that bear, dog and rat remains are found exclusively in the vaulted building, while the only roe deer remains come from the summit building.

EARLY ROYAL PERIOD, SECOND HALF OF THE 13TH CENTURY

The largest number of remains studied came from the early royal period, with a total of 2482 remains, mostly found in the 'vaulted room' (NR = 977) and only 16% (NR = 403) in the summit building. Unidentified remains were the most abundant (NR = 977; 40%), with an NISP of 878 (35% of the NR) and 627 remains (25% of the NR) identified by anatomical rank.

During this period, cattle became the dominant species, accounting for 38.5% of the NISP (NISP = 338), followed by caprines (NISP = 318; 36%). The pig is the third taxon, much less abundant, with 129 remains (14.7% of the NISP). Birds are well represented, with 67 remains, including 35 from chicken (4% NISP). Geese are still present, and ducks appear with a single fragment. It should also be noted that in 1999 Forest mentioned the presence of a partridge bone. Roe deer (NISP = 1) are accompanied in this phase by red deer (NISP = 10; 1.1%). Lagomorphs, rodents and malacofauna represent less than 1% of the NISP each (Table 14.2).

As in the previous period, we find the same reversed pattern between the relative proportions of caprines and cattle in the two buildings. Unlike the previous phase, the roe deer remains come from the vaulted building, as do the goose and rat remains. The duck, on the other hand, comes from the summit area.

ROYAL PERIOD, END OF THE 13TH CENTURY–EARLY 14TH CENTURY

For the royal period, 1300 remains were analysed, 36% of which were identified to species level. The vast majority

Table 14.3. Fish remains from Peyrepertuse. Underscored are measurements taken on the caudal side. Measurements followed by 'cs' correspond to those taken from poorly preserved bones.

| Peyrepertuse 2012 |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
|-------------------|--------|------|-----|------|------|-----|-----------------|------------|------|--------------|-----------------|---------------------------------|
| Zone              | Sector | US   | NRR | NRDa | NRDt | Ind | Anatomical part | Laterality | Rank | Family       | Genra           | Species                         |
| Measures mm       |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| M1 M2 M3          |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| Seasonality       |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| Marks             |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| Comments          |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   |      |      | yes |                 |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   |      |      | yes |                 |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 2   | yes  |      |     | Rib             |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  |      |     | Preopercular    | G          |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  |      |     | Preopercular    | G          |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  |      |     | Dental          | D          |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVpc            |            | 3    | Sparidae     | Diplodus        | Sargus sargus                   |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 6.3 6.8 8.08 Not readable       |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVpc            |            | 4    | Sparidae     | Diplodus        | Sargus sargus                   |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 6.05 6.75 6.82 Not readable     |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Sparidae     | Pagellus        | Erythrurus                      |
|                   |        |      |     |      |      |     | Frontal         | G          |      | Triglidae    | Chelidonichthys | ssp.                            |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | Dental          | G          |      | Lophiidae    | Lophius         | ssp.                            |
|                   |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Scombridae   | Thunnus         | ssp.                            |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 25.55 28.58 25.88 Not readable  |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | Cleithrum       | G          |      | Moronidae    |                 | ssp.                            |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | Cleithrum       | G          |      | Moronidae    | Dicentrarchus   | ssp.                            |
|                   |        |      |     |      |      |     |                 |            |      |              |                 |                                 |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | VTc             |            |      | Moronidae    | Dicentrarchus   | ssp.                            |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 19.76 21.85 26.66 Not readable  |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | VTpc            |            | 7    | Moronidae    | Dicentrarchus   | Labrax                          |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 7.61 8.74 9.17 Not readable     |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | VTpc            |            | 9    | Moronidae    | Dicentrarchus   | Labrax                          |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 7.17 7.72 10.02 Not readable    |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | VTc             |            | 19   | Moronidae    | Dicentrarchus   | Labrax                          |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 10.19 10.74 12.79 Not readable  |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | Articular       | D          |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 9.96 11.98 8.27 Not readable    |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVpc            |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 10.54 10.46 12.77 Not readable  |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 10.15 11.68 9.75 Not readable   |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 7.98 9.04 8.26 Not readable     |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 7.13 7.36 6.55 Not readable     |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 8.31cs 9.49 9.65cs Not readable |
| 1                 | 1      | 1009 | 1   | yes  | yes  |     | TVc             |            |      | Merlucciidae | Merluccius      | Merluccius                      |
|                   |        |      |     |      |      |     |                 |            |      |              |                 | 9.09 9.59 10.57 Not readable    |

of the material came from the vaulted room (91.5% of the remains), and only 8.5% from the summit area.

Species diversity is more limited during the royal period, with 12 taxa. Caprines account for almost 51% of the NISP, followed by pig (22.7%), cattle (14.2%) and chicken (5.4%). Bears, lagomorphs, deer and geese each account for less than 2% of the NISP (Table 14.2).

Unlike previous periods, the relative proportions of caprine, bovine and suid are more or less equally distributed between the two zones. On the other hand, all of the red deer, bear, lagomorph and bird remains studied (with the exception of one chicken humerus) came from the vaulted room. All of the material in the summit area originates from domestic species.

### *Cattle*

#### SKELETAL REPRESENTATIONS

During the feudal and early royal periods, the head of cattle and extremities of their limbs are in the majority. The thorax and proximal limb segments, richer in meat and marrow, are generally poorly preserved, particularly the femur. During the royal period, the head and thorax are more common, although this must be balanced by the much smaller number of remains than in previous phases. The girdles are well represented, unlike the long bones. These have the particularity of almost exclusively containing epiphyseal portions, with only one fragment of diaphysis (Fig. 14.11). While no statistically significant correlation was identified in the feudal period between MAU% and mineral density, nor with the profitability of the various anatomical parts (total product), the correlation was highly significant in the early royal period. The densest parts are more frequent ( $p = 0.000$ ;  $\rho = 0.616$ ), while the most nutritious are clearly the most under-represented ( $p = 0.000$ ;  $\rho = -0.743$ ).

#### DEMOGRAPHY

The age at which cattle were slaughtered seems to vary considerably. Nevertheless, the four individuals identified during the feudal period were young: a calf aged between ten and twenty months, a sub-adult aged around two years and two adults aged between three and four years. During the following period (MNIc = 8), no selection based on age is visible. There was a calf aged between three and six months, a second-year calf, two sub-adults aged around two years, a young adult aged between three and four years, two adults and an older adult. Finally, during the royal period, four individuals were identified, including a calf aged less than seven months, two adults aged three to four years and one aged five to eight (Fig. 14.3).

#### BUTCHERY

In the feudal period, the marks are concentrated mainly on the vertebrae, which are very regularly split in two lengthwise using both sharp and blunt percussion. In addition to

the spine, traces can be seen on the skull and metapodia, with both types of percussion identified. During the next phase (Fig. 14.12), the frequency of anthropogenic traces increased significantly. The head, and in particular the mandible, were exploited: the head was sliced through the atlas, then the cheeks and the tongue were recovered (striations on the mandible and a hyoid bone). The spine appears to have been cut in half lengthways, then in transverse sections. The ribs were isolated by slicing the angle. The limbs were essentially detailed by blunt blows to the diaphyses, the use of the cleaver and knife being very often limited to joints such as the elbow, the ankle and the feet. Finally, during the last period, and despite the relatively low NISP ( $N = 66$ ), cutting marks remain very frequent and relatively similar to those of the previous period: with the consumption of the mandible, the separation of the carcass into two symmetrical halves and the preferred use of blunt blows to cut long bones. On the other hand, it seems that traces of boning were more present during this phase, with the shoulder, vertebrae and rump. The tail was severed in the distal part of the sacrum and probably consumed at least during the feudal period.

### *Caprines*

#### SKELETAL REPRESENTATIONS

In the feudal period, the leg is the best-preserved piece of caprine meat (Fig. 14.13). The bones of the head are also fairly common, while the foot elements are rare. In the following period, the frequency of the skull increases, as does that of the shoulder. The foot is still under-represented. During the royal phase, the entire skeleton is well preserved, with the exception of the foot. In all three phases, vertebrae and ribs are present in elements not determined by species, which suggests that the entire skeleton must have been deposited, although the degree of use of the different portions varied.

The feudal period is the only phase in which the MAU% and utility indices show a statistically significant correlation. The latter is moderate and positive with the MGUI ( $p = 0.004$ ;  $\rho = 0.453$ ) and with the meat index ( $p = 0.002$ ;  $\rho = 0.489$ ). The correlation was not significant with marrow and bone grease, suggesting that meat was the main resource sought by consumers.

#### DEMOGRAPHY

During the three periods, caprines were mainly slaughtered during their second year, and more generally, before the age of three. This trend became more pronounced over time, with 67% of animals during the feudal period, 73% at the beginning of the royal period and 78% during the royal period (Fig. 14.5).

The *Ovis/Capra* distribution could only be determined sporadically, particularly for the feudal and royal periods. During the early royal period, on the other hand, sheep clearly dominated, with seven individuals for one young



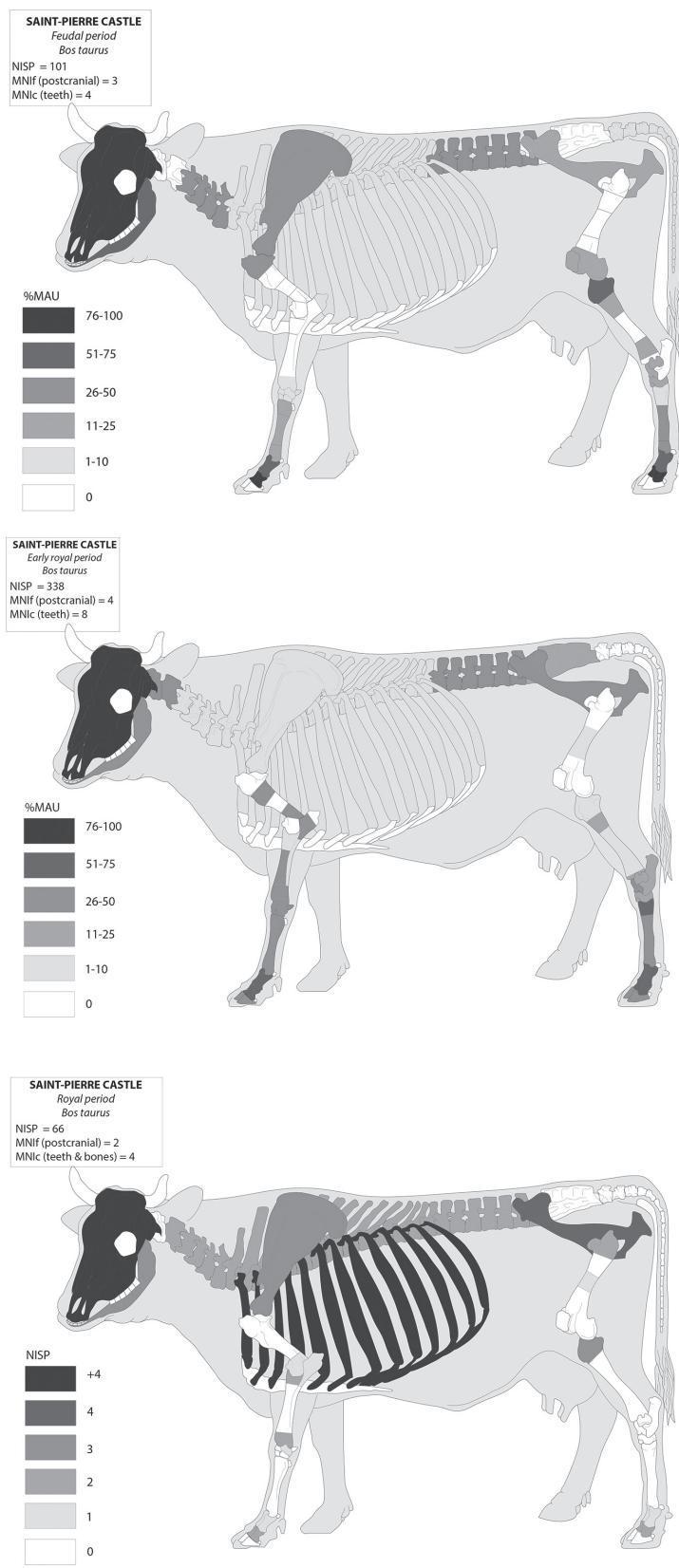


Fig. 14.11. Cattle skeletal profiles at Saint-Pierre, expressed in MAU% for the feudal and early royal period and in NISP% for the royal period

**SAINT-PIERRE CASTLE***Early royal period**Bos taurus*

NISP = 338

MNIf (postcranial) = 4

MNIfc (teeth) = 8

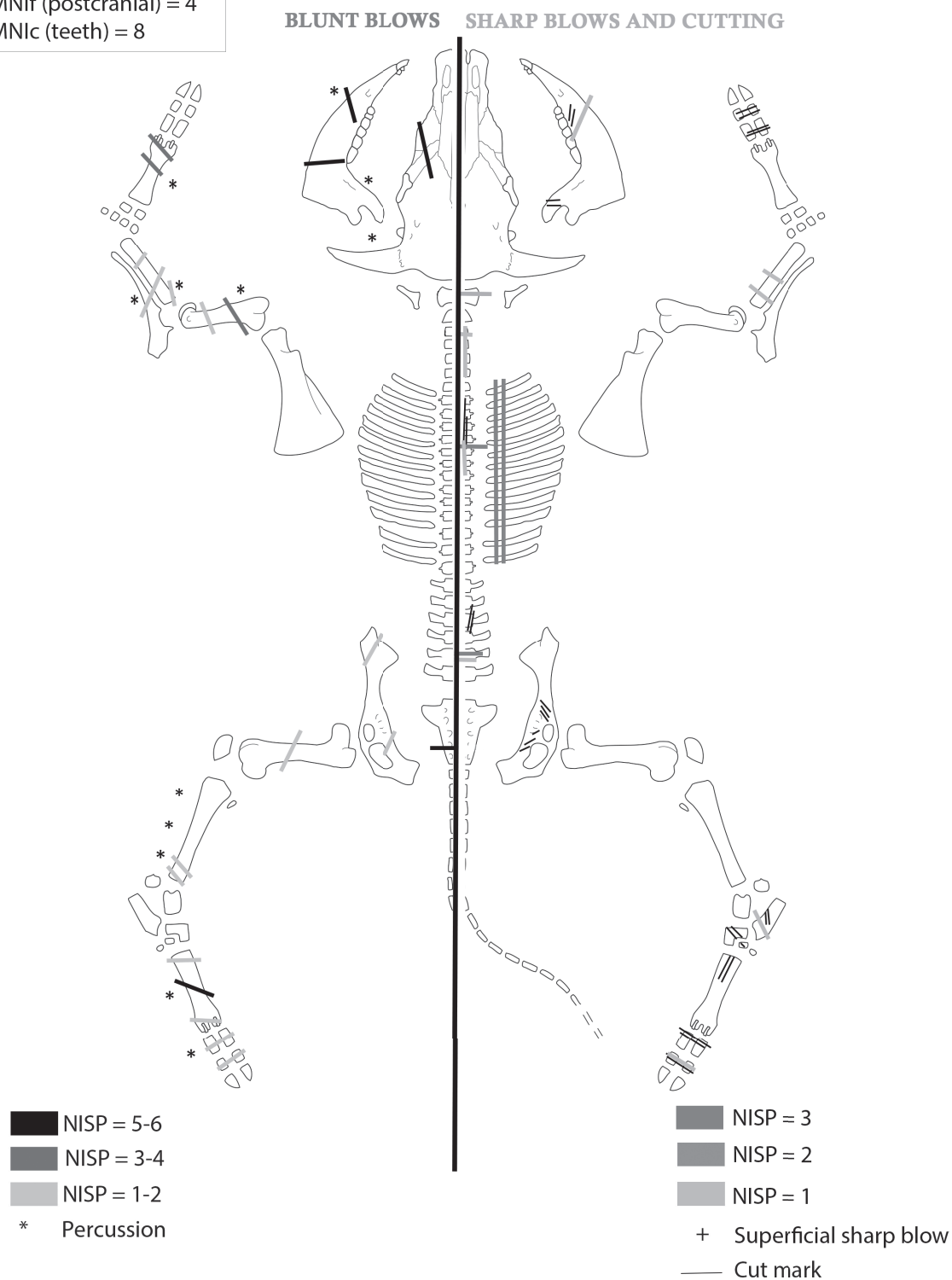


Fig. 14.12. Cut marks on cattle in Peyrepertuse, early royal period

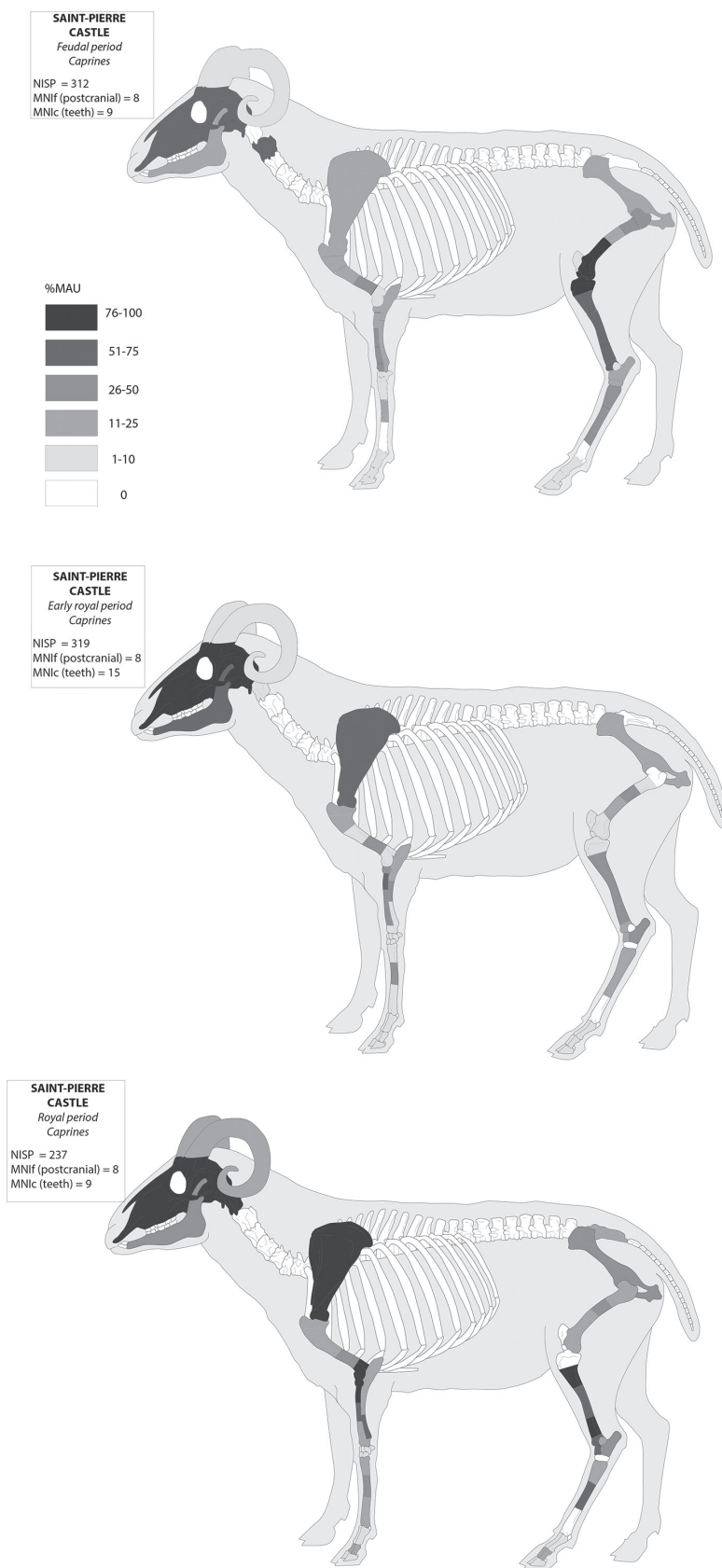


Fig. 14.13. Caprines skeletal profiles at Saint-Pierre, expressed in MAU%



goat (ten to twenty months old). The sheep identified were mainly slaughtered when they were around two years old (four animals) or slightly younger, between ten and twenty months old (two cases). Only one of them was older, slaughtered at an advanced age.

We mentioned above the dominance of cattle in terms of NISP during certain phases (in particular the early royal period) or in certain areas (in the vaulted building). However, if one considers the distribution of MNI, it becomes clear that caprines are in the majority in all the contexts studied. The relative contribution of each species to the diet is impossible to establish. Not only does it appear that not the entire body of the animal was present on site, but also that in some cases, particularly beef, the portions preserved were not very nutritious.

#### BUTCHERY

The dismemberment of caprines is very regular over time. If we supplement the thorax data with elements not identified with the species, it is possible to reconstruct the carcass cutting process. As with cattle, the head was separated from the trunk. In caprines, this stage left knife marks on the occipital. The head was then prepared by recovering the brain, cutting the mandible into sections and removing the tongue (at least in the royal period). The entire length of the spine was cut in half, followed by the limbs. Usually, blunt percussion was preferred for the long bones, enabling quite regular portions to be removed. The shoulder was divided in two, then the feet were isolated. The hind limb was treated in a similar way, with the leg also divided in two and the feet isolated. Numerous fractures are recurrent, suggesting a relatively standardised cut, even if the blows are not always precise (Fig. 14.14).

#### *Pigs*

##### SKELETAL REPRESENTATIONS

The skeletal representation of the pig is very consistent over time, with the majority of the skeleton present (Fig. 14.15). The head is always the best represented element, followed by either the humerus or the radius, as well as the pelvis. The upper shoulder is rarely present, as is the ham. The presence of the thorax, apart from the atlas and axis, is difficult to assess. It is possible that some remains are present in elements unidentifiable to the species. No correlation was found between MAU% and density or utility indices.

##### DEMOGRAPHY

The age at which pigs are slaughtered is also homogeneous over time. Between 56% and 67% of pigs are slaughtered between two and three years old. Young pigs, aged between three months and one year, always account for 33% of the total. Individuals aged four years and over are almost totally absent, with only one individual identified during the early royal period. It should also be noted that during the

last phase, the consumption of pigs aged around two years increases to 50% (Fig. 14.7). The presence of wild boar was not addressed in this study. However, the work carried out by Forest (1999) highlighted its occasional presence during all periods.

#### BUTCHERY

During the feudal and early royal periods, pig bones were butchered almost exclusively by blunt force. The use of the cleaver was very limited, with one mandible sliced in the feudal period and four occurrences in the following period, visible on various portions. Traces become more frequent in the royal period, but blunt blows remain in the majority. Over the three periods, these marks reveal the consumption of meat along the entire skeleton, from the head to the feet.

#### *Other species*

No equidae remains have been identified on the site. Commensals are also very rare, with one dog phalanx from the feudal period. Almost all the rat remains (17 out of 18) also come from this phase (MNI = 2). Cervids were present throughout the occupation of the site, but always in smaller proportions. Roe deer is represented by a third phalanx in each of the first two phases and is absent from the royal period. Red deer appeared from the second phase onwards (MNI = 1), mainly with portions from at least two thighs (NR = 8) and a remain of a scapula.<sup>11</sup> All of these elements bear traces of cutting: the pelvis and femurs are sliced and bear traces of impacts. The leg was disarticulated at the talus, which bears striations. In the royal period (MNI = 1), fewer remains were found, but these also corresponded mainly to the hind limb, with femur and tibia. A first and third phalanges have also been identified, although it is not possible to determine whether they are anterior or posterior. The bear was identified in the first (NR = 3, MNI = 1) and last phases (NR = 9, MNI = 2). All came from the vaulted building near the rampart. They are mainly lower leg and thigh parts, some of which were immature. One molar came from a bear cub between five and eight months old, hunted in summer, between June and September during the royal period (Zavatsky 1976). The only remains bearing anthropic trace is a severed tibia. Nevertheless, in his report, Forest (unpublished) indicates the presence of traces of skinning (on the metacarpals), disarticulation (on the wrist and knee), boning of the thigh and cutting of bone segments.<sup>12</sup> Lagomorphs (mostly hares according to Forest unpublished) are generally scarce, with one individual in the feudal and royal phases and two in the early royal phase, including a young hare.

As on the other sites, the chicken is the main bird encountered throughout the site, with an MNI of 2 to 3. The axial skeleton, and in particular the vertebrae, is always greatly under-represented. In the feudal period, the wing, pelvis and thigh are the main elements found. A female was identified among the three individuals from this phase. In

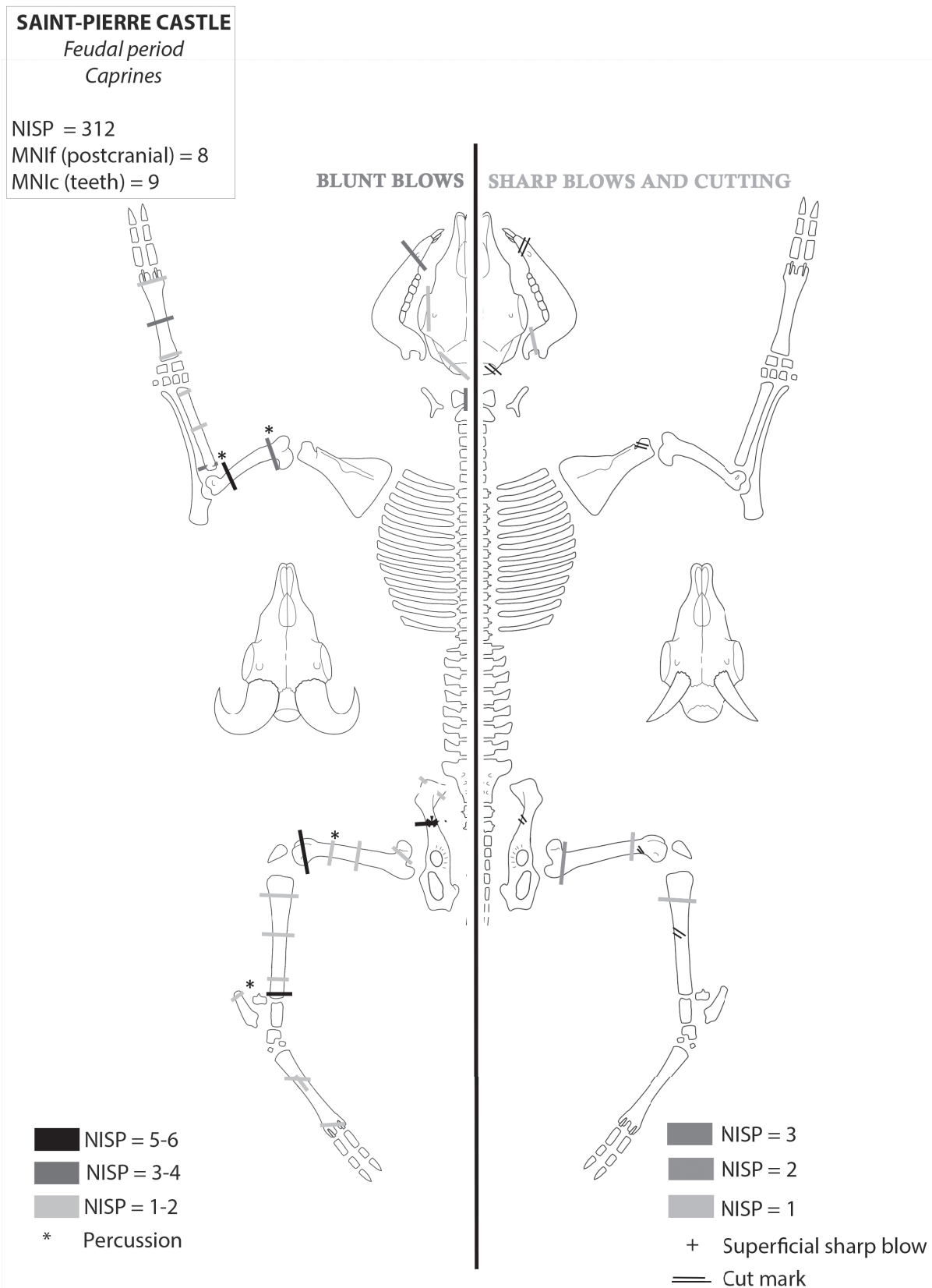


Fig. 14.14. Cut marks on caprines in Saint-Pierre, early royal period

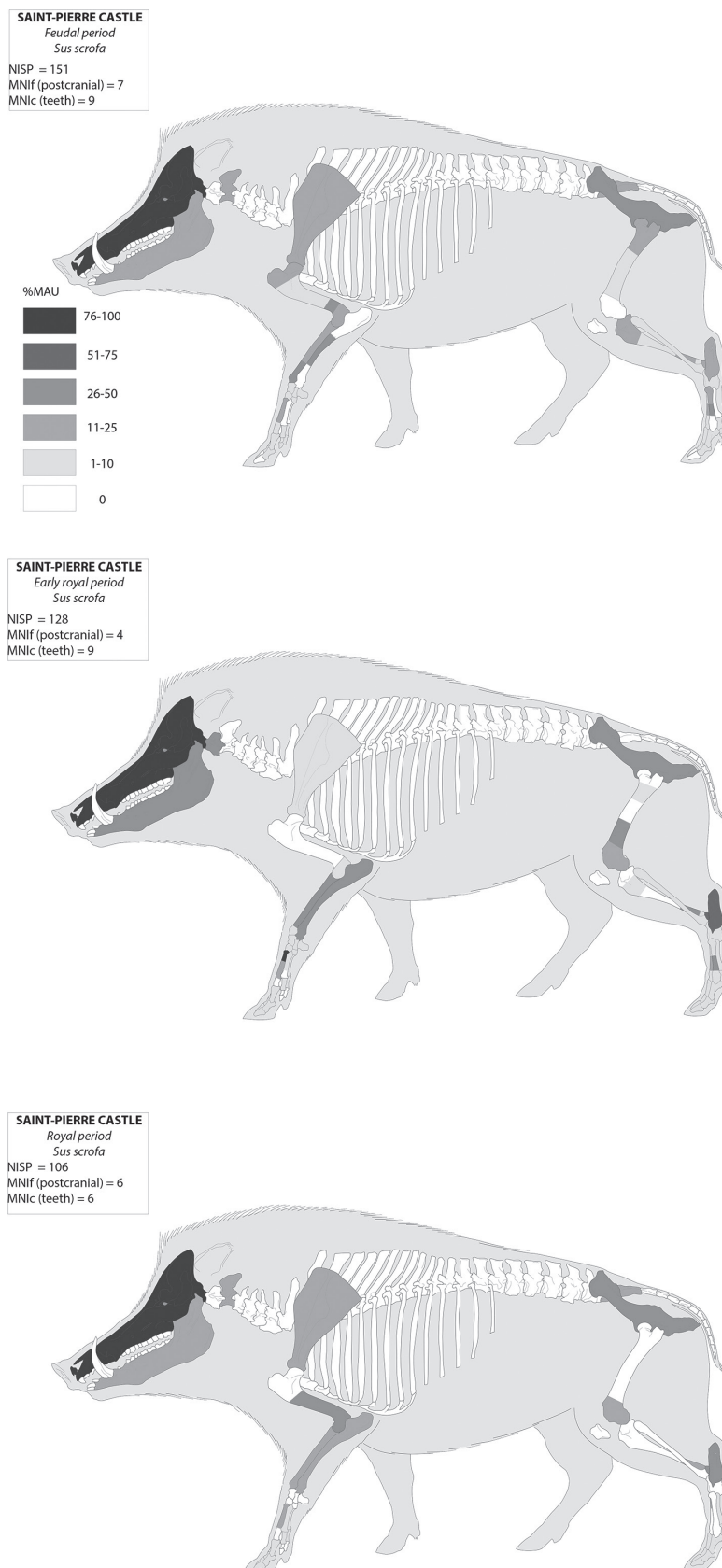


Fig. 14.15. Pig skeletal profiles at Saint-Pierre, expressed in MAU%



the following period, at least two individuals, including a female and a juvenile, were identified. The entire skeleton seems to have been preserved, with the exception of the vertebrae and ribs, while in the royal period, the wing, upper thigh and, to a lesser extent, the head are found. In addition to chicken, some goose remains have also been identified from different periods. Wing remains are particularly common, even though the MNIc is always 1. Finally, a duck pelvis has been identified from the early royal period. In addition to these well-identified elements, it should be mentioned that many of the remains included in the 'avifauna' taxon are of the size and conformation of partridge (*Alectoris rufa* or *Perdix perdix*), or quail/pigeon size, although it was not possible to identify them with certainty.

Fish remains were the subject of a detailed study by Piquès (in Forest unpublished and Maso and Cazes 1998). These remains, essentially of marine origin (Mediterranean), were recovered from the first two phases of occupation and suggest an artisanal activity of fish processing on the coast, for transport inland. This type of transport of marine products appears to be widespread in the Pyrenees.

## Discussion

### *The relative importance of the main domestic taxa*

Several quantification units and methods can classify the respective importance of species in meat consumption: the number of remains (NISP), the minimal number of individuals (MNI), the mass of bones or the Meat and Offal calculation (MOW) are few examples (Vigne 1991; Lyman 2008; Lignereux 2011). However, they do not always yield uniform results. The MNI, in particular, has faced many criticisms (e.g. Plug and Plug 1990; Lyman 2008). It is moreover difficult to use in meat trade contexts, where only certain parts of animals arrive at the consumption site, and selective parts or ages can bias results. Regarding bone mass, we argue it does not necessarily correlate with potential meat mass. The Saint-Pierre de Fenouillet early royal period illustrates this: a strong positive correlation exists between MAU% and mineral density, but a strong negative one between MAU% and meat yield. In other words, cattle elements best represented are both the densest but the least nutritious.

This study uses the NISP, as recommended by Lyman (2008). Although dependent on fragmentation and ignoring meat yield profitability, it remains the most used, comparable and descriptive unit. The discussions must therefore consider that a cow provides much more meat than a pig or sheep. This imbalance is critical where the NISP% of cattle and other taxa are similar. Thus, it is not possible here to assess the quantity of meat potentially supplied by each species. What is possible, however, is to assess the respective place of these taxa within the different faunal assemblages.

The distribution of remains within the domestic triad (cattle, caprines and pigs) is homogeneous across phases and sites, no groups seem to emerge. Sheep and goats are almost always in the majority, accounting for between 40% and 80% of the NISP of the triad (Fig. 14.16). The royal garrison of Peyrepertuse focused meat consumption mainly on small bovids, accounting for 79% of the triad's remains. In the Castellàs, caprines gained importance from the feudal period to the end of the Middle Ages, accounting for 40%, 49% and then 63% of the triad. The early royal period of Saint-Pierre castle is the only exception, with caprines and cattle almost equal (with 41% and 43% respectively), though cattle remains correspond mainly to the least nutritious skeletal parts.

These results align with regional data: caprines, followed by pigs, were the main sources of meat, while cattle were less present (Forest 1997; Forest and Rodet-Belarbi 2011). To provide more detailed comparisons, eight contemporaneous local assemblages have been integrated (Figs 14.16 and 14.17). These sites yield at least 400 remains from the domestic triad and are located near borders or inland, including both lowland and mountain sites, as well as agglomerations and rural dwellings, both elite and lower status. The feudal period is best represented, with five sites: three castles – Carcassonne (Loppe *et al.* 2003), Cabaret, in Lastours (Durand *et al.* 1997), and Termes (Cazes 2009; Massendari 2010); a town, Saint-Bertrand-de-Comminges (Lignereux and Périn 2006); and the coastal Saint-Martin le Bas in Gruissan (Duperron *et al.* 2021). Usson Castle (in Rouze, Lignereux *et al.* 1995) and Castlar village (Durfort, Durand *et al.* 1997) date from the royal period. Montségur castle (Lignereux and Peters 1999) has remains from both periods. Results across phases were homogeneous and merged.

In general, caprines dominate, except at Montségur (feudal and royal period) and Termes (feudal), which yielded a majority of pig remains (43% and 64% of the triad respectively). Being c. 60km apart and at different altitudes (around 1200m at Montségur and 450m at Termes), this similarity is puzzling. At Termes, the social status of the consumers had been suggested as an explanation for the preferential consumption of pork. In fact, this was a common feature in rural seigneurial circles in the 10th–12th centuries. It can be seen, for example, at the castle of Andone in the Nouvelle Aquitaine region (Rodet-Belarbi 2009) and in Provence (Unsain *et al.* 2023a; Unsain *et al.* 2023b). But not all the elite sites in the studied region provide this type of result for the 10th–12th centuries. For example, at the castle of Cabaret, pigs came after caprines. However, a pattern seems to emerge when the sites are divided between urban and rural, whether from the feudal or royal period. Indeed, on all the rural sites, pigs come either first or second, behind caprines, while in the two urban sites, pig is supplanted by cattle, which came second. This trend is confirmed when we include the seven assemblages in our corpus, all

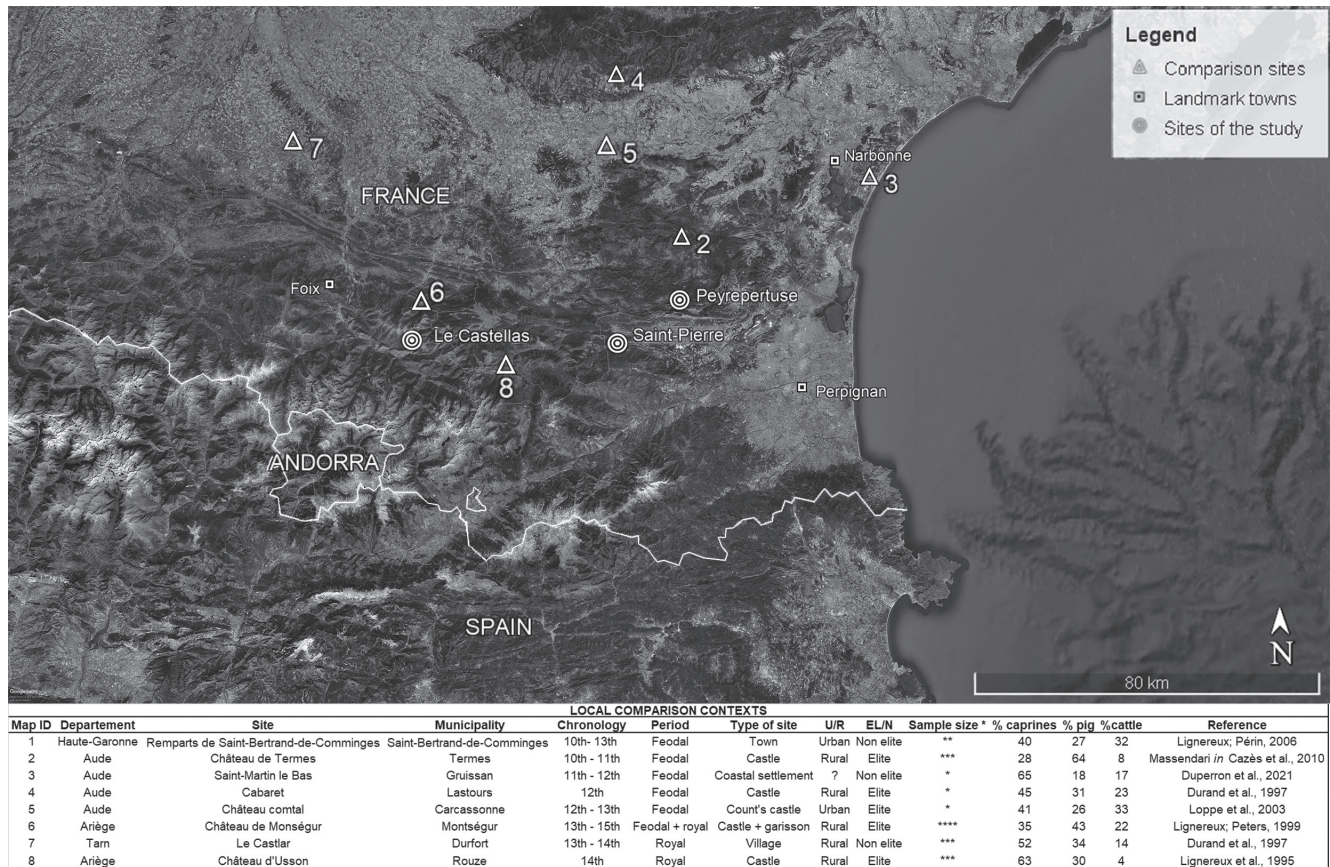


Fig. 14.16. Geographical location and presentation of comparative contexts, with the relative proportions of cattle, caprines and pigs, expressed in NISP%. \* Sample size refers to remains from the domestic triad. \* = 400 to 600 remains; \*\* = 601 to 1000 remains; \*\*\* = 1001 to 2000 remains; \*\*\*\* = more than 2001 remains (Map data: Google, SIO, NOAA, U.S. Navy, NGA, GEBCO. Image: Landsat/Copernicus)

of which are rural: in six of the seven samples, pigs are more common than cattle (in NISP%). The only context in which cattle are better represented (i.e. early royal period of Saint-Pierre), remains are, as we have seen, essentially parts of low nutritional value. The dominance of caprines is found in almost all of southern France, where the arid climate and relief, typical of Mediterranean environments, are favourable to the rearing of these two species (Forest and Rodet-Belarbi 2011; Unsain *et al.* 2023b). The only exception is the peri-lagoon region of Camargue, where the particular environment has favoured the significant presence of cattle since the high Middle Ages (Gardeisen 1993). We will also see later that the environment was not the only factor that encouraged caprine farming. In fact, major economic reasons led to its expansion in the second half of the Middle Ages (Unsain *et al.* 2023b). These will be discussed further below.

### Cattle supply strategies

The animals identified are generally represented by a few remains, which suggests that only small pieces of each individual were consumed on site. For this reason, we will

not discuss the quantity of meat provided, but rather its quality and the way these castles were supplied. During the feudal period, supplies to Saint-Pierre and Le Castellas were concentrated mainly on relatively young animals that produced quality meat (Fig. 14.3) (Blaise 2010). In Saint-Pierre, cattle were slaughtered between the ages of 1 and 2, then between 3 and 4. In Le Castellas, although 80% of the animals were slaughtered before the age of 5, all ages were represented. The age distribution changed in Saint-Pierre at the start of the royal period. The supply now included almost all ages, except the youngest. For the first time, culled animals appeared, accounting for almost 40% of the total (5–8 years old, but also very old). For the royal period, the results are mixed. Although Castellas and Saint-Pierre still seem to rely on quality meat, with respectively 70% and 75% of cattle slaughtered before the age of 5, there is a very wide age range at le Castellas, from suckling calves to very old cattle. In Saint-Pierre, on the other hand, we find the youngest, the adults and the culls. But perhaps this discrepancy is due to the small assemblage size at Saint-Pierre. Finally, for the late Middle Ages, the Castellas did not show any major variations from earlier data: the varied



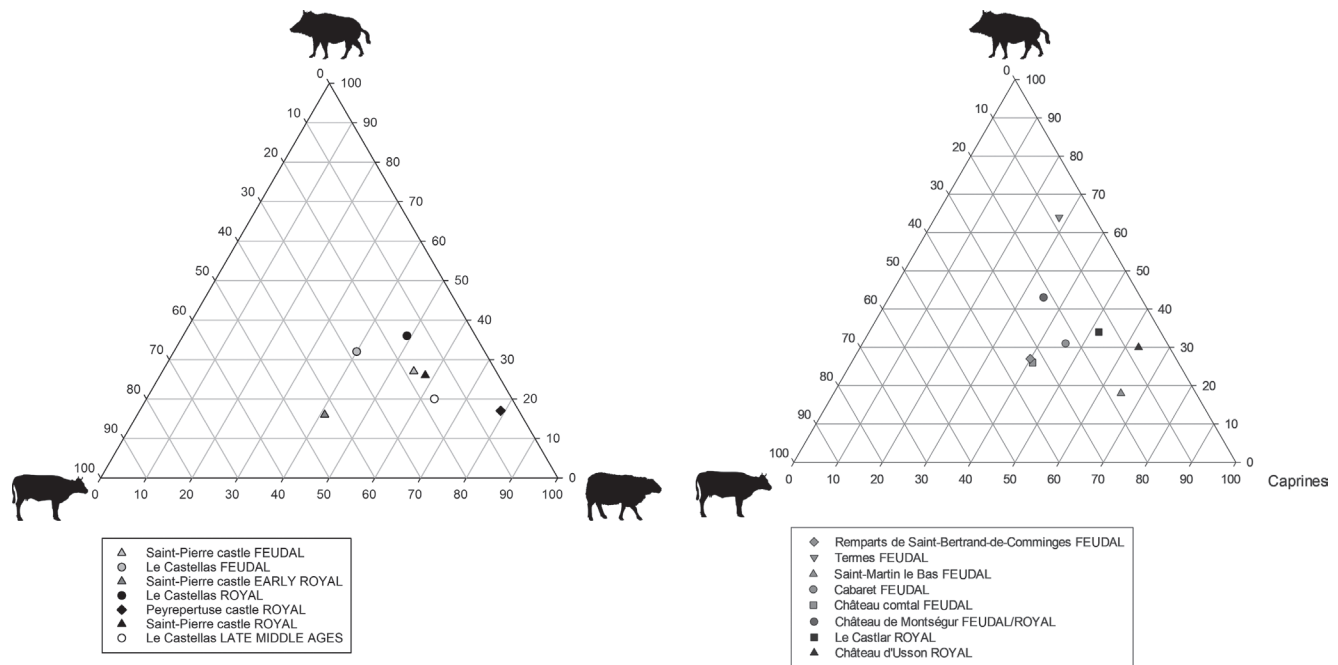


Fig. 14.17. Ternary diagram of the relative proportions of cattle, caprines and pigs, expressed in NISP%. On the left-hand side: for the studied sites; on the right-hand side, for comparison contexts

ages favoured the quality of the meat. It is rather difficult to identify trends between contexts, as the sample size is often quite small.<sup>13</sup> However, one group seems to stand out from the others, that of Saint-Pierre early royal period. This is the context where the proportion of reformed animals is the highest. These changes occurred too early to be attributed to the crises of the 14th century, but they could be due to the presence of the garrison, which may have had a different diet from the aristocratic families, consuming older individuals. This hypothesis is difficult to support, however, as the decline in beef quality was temporary and improved again during the royal period. It is possible that this transitional period reflected a short-term disruption to the castle's (and perhaps the village's) supply routes as it came under royal control. Interestingly, this only applies to cattle, whereas caprines seem to have mainly provided animals reared for meat during both periods. This could be explained by the omnipresence of sheep in the region and the ease with which they could be procured. Perhaps the task was more difficult for cattle.

On the other sites, cattle provided fairly good quality meat, although culled animals (5–8 years old) were common. Very old cattle, on the other hand, were almost totally absent. Some assemblages, in particular the Castellat and the early royal period at Saint-Pierre, seem to reflect the different stages of herd regulation (Blaise 2010), but the results are insufficient to suggest local breeding. In the context of breeding for milk, traction and meat, we would expect to see more adults being culled, as in the village of Castlar, in

Durfort, during the royal period (Durand *et al.* 1997; Blaise 2010). Beef cattle reach weight maturity at around three years of age, making it possible to draw a line between rearing for meat and rearing for milk and traction (Lepetz 2007). At all the sites, except for the early royal period at Saint-Pierre, cattle were clearly reared for slaughter. The very scattered portions identified suggest, moreover, that the meat was purchased at all the settlements. The occasional purchase of beef by elites has been identified in other castles in the south of France, particularly in Provence, during the feudal period (Unsain 2021). This would imply the proximity of markets where supplies could be obtained (we know it existed near the Castellat), or of a specific circuit set up by the *Faidit* lords, and then the agents of the King of France, to obtain these supplies. It is even possible to discern a slight disruption in the supply of beef at the time of the transition between the two powers in Saint-Pierre.

Anatomical profiles and butchering marks can help to specify the quality of the products consumed and clarify how the cattle were supplied. There are many similarities between the sites studied. It seems that, in general, beef arrived at the sites already prepared and partially boned, at all periods. This can also be seen in the village of Cabaret in the 12th century (Durand *et al.* 1997). In our contexts, vertebrae are almost completely absent. Cranial remains and feet are very often in the majority, followed by girdles. The long bones, particularly the fleshiest (humerus, radius, femur and tibia), on the other hand, are always represented by sporadic portions. These results suggest that the preserved



bones are less characteristic of the pieces consumed than of the way in which they were consumed. In fact, heads and feet generally arrived whole in kitchens, where they were then prepared. Whole heads can be seen for sale on butchers' stalls in medieval iconography (e.g. in various *Tacuinum sanitatis*). The rest of the carcass, on the other hand, could arrive ready to eat, boned or not, perhaps depending on the type of cooking. The concentration of low-nutrient elements at the early royal period of Saint-Pierre could in this sense indicate an intensification of the practice of boning. This practice makes it even more difficult to assess the place of each animal in the meat diet. It should be noted, however, that the presence of feet is often associated with artisanal activities such as butchery or tanning (Leguilloux 1994; Rodet-Belarbi *et al.* 2002; Cotté 2008). They were, however, consumed in several rural castles from the feudal period in Provence (Unsain 2021). In these contexts, this consumption was linked to the presence of local cattle breeding. When an animal was slaughtered, these elements, although not usually prized, were available and were therefore consumed. Sheep feet, on the other hand, are almost always absent from these contexts, even when they seem to have been reared locally, suggesting a difference in status between the feet of these two species. There is no doubt that the feet of different species were consumed in the Middle Ages and the modern period, and there are even numerous recipes for them, as in *Le Ménagier de Paris*. These parts, rich in gelatine, could give consistency to broths and stews (Chomel 1740; Bruyant 1846; Stouff 1970). The cut marks (fractures, striations) observed on the feet of cattle in the various contexts also point to their consumption.

More generally, it is difficult to identify any chronological changes in butchery practices or supply strategies. Peyreperuse castle is represented by a single period, and in Montailou, cattle data is too sparse to show any changes. The small presence of cattle in Montailou is in fact mentioned in the 14th century (Le Roy Ladurie 1985). A few oxen were used in the fields for ploughing. This may appear contradictory to the quality meat they provided for the castle. In fact, while cattle remains were rare in the *castrum*, they were very numerous in the neighbouring village of Ascou. From the 13th or 14th century, cattle were even kept there by the whole community. The locality was therefore well placed to supply quality beef to the surrounding area. Ultimately, Fenouillet is the only place where any changes in beef consumption can be identified. In addition to the possible increase in boning from the early royal period onwards, there was also a marked intensification in the traces of cutting, which lasted until the end of the Middle Ages. From the feudal period onwards, the use of the cleaver was concentrated on the most difficult areas to cut: vertebrae and joints. For the diaphyses of long bones, butchery is mainly represented by blunt blows. Is the intensification of the marks due to new practices on the part of butchers? The region's rural sites,

unlike those in the urban areas, do not suggest that butchers made any patterned cuts during the Middle Ages (Forest and Rodet-Belarbi 2011). Does Fenouillet illustrate a more developed supply of meat in the vicinity of castles than in isolated settlements, bringing the results closer to the urban model? Or simply a commercial circuit specific to the castle and different from the rest of the population, as existed in Tours (Noizet 2001, 2002; Cotté 2008)?

### *Caprines supply strategies*

Distinguishing between sheep and goats from an osteological point of view is not always easy, and often the number of individuals identified at species level is too low to detect any trends. In only two cases was there evidence of dominance of one species over the other (at Castellás in the feudal period and at the early period of Saint-Pierre), and both favoured sheep. Goats were nevertheless present in all contexts. This is consistent with textual sources that mention the presence of sheep throughout the region, as well as their economic importance, with trans-Pyrenean transhumance, butchers' accounts that place them at the top of sales, and the fabric industry, which was highly developed in certain towns. References to goats are less frequent, but in the 14th century there is mention of a shepherd who specialised in herding goats (Le Roy Ladurie 1985; Petrowiste 2004; Bochaca 2005; Coulon 2014).

While for cattle, the quality of the meat seemed to be a determining factor for the consumers of the castles studied, who favoured the slaughter of relatively young individuals, the results for caprines were somewhat different. The ages observed are very varied, in all contexts. The proportions of meat animals, i.e. those no more than two years old (Blaise 2010) is lower than for cattle, generally accounting for between 40% and 55% of the total (Fig. 14.5). While this type of result is understandable for the royal period, which was occupied by garrisons, it is more surprising for the feudal period. In south-eastern France, in Provence, sheep farming evolved from a subsistence economy supplying milk, wool and meat between the 10th and 12th centuries, to a speculative economy focused on wool from the 13th and 14th centuries. The repercussions in terms of consumption saw markets flooded with mutton of mediocre quality, with a majority of relatively old animals and few younger individuals (Unsain *et al.* 2023b). The results from Le Castellás, Peyreperuse and Saint-Pierre do not seem to correspond to commercial livestock farming oriented towards wool production. The first two are closer to a subsistence economy aimed at exploiting all the animals' resources, while maintaining a fairly good quality of meat, perhaps to guarantee a fair price with the butcher. By the end of the Middle Ages at Castellás, on the other hand, 60% of the animals were culls. These animals provided meat of low quality. There are several possible explanations for this change. Firstly, there could have been a large-scale production of milk

and/or wool. The textile industry was active, first in large towns such as Perpignan, then in the countryside from the 15th century onwards (Bochaca 2005; Coulon 2014). But we know that in the village of Montailou, associated with Le Castellàs castle, textile production was limited and the products were not exported outside the village (Le Roy Ladurie 1985). It is also possible that the socio-economic status of consumers changed, justifying the purchase of less expensive meat. It should not be forgotten, however, that this settlement dates back to the 14th–15th centuries, a time of crisis marked by plagues, political unrest, climate change and famine. Montailou was hit hard by the plague. These various events disrupted the region's commercial circuits (for example, with less choice in the products offered for sale) and led to an increase in prices, which could explain these changes (Le Roy Ladurie 1985; Petrowiste 2004).

Saint-Pierre de Fenouillet differs somewhat from this trend in that, as with cattle, the supply of caprines appears to be essentially focused on quality meat, with 67% to 78% of individuals slaughtered in the first two years of life. This site provides the highest proportions of lambs (around 35% to 45% of the animals are slaughtered before the age of two) and young adults of around two years of age (over 30% in each phase). In fact, this trend increases with each phase. It is difficult to explain this feature. The proximity of Perpignan could have favoured access to a diversified market, which would have enabled the best quality meats to be chosen, but Peyrepertuse is also close by and does not have this particular characteristic. It is possible that the supply of sheep was different here from the other two sites. In fact, the ages at which sheep were consumed at Castellàs and Peyrepertuse are quite similar to those in the village of Dufort (Durand *et al.* 1997). Perhaps the supply chain for caprines was the same as for the rest of the population, while Saint-Pierre castle was able to set up a different one. These data are surprising when considering that the Bas Fenouillède region specialised in wool production. Customers came from Roussillon, on the other side of the border (Coste 2021). In the viscounty, this type of farming would have involved the slaughter of relatively old animals, which is very different from the animals consumed at Saint-Pierre castle. Medieval sources also mention that live sheep were traded across the border in both directions (Coste 2021). It is therefore possible that some of the sheep imported into Fenouillède region were destined to fill the tables at the seat of the Viscounty of Fenouillède, in Saint-Pierre castle, whether they were bought directly for the castle or whether a butcher acted as intermediary (Bochaca 2005). They would have been able to offer its lords quality meat, different from that available in the rest of the region, which was probably mainly made up of reformed animals exploited for their fleece. We know, for example, that the Pyrenees and sub-Pyrenees were essential to the supply of sheep meat to Toulouse, so such connections may well have existed

elsewhere (Le Roy Ladurie 1985). Actually, we know that wool and livestock (equids, cattle, pigs, sheep and goats) are among the key products in cross-border trade between Fenouillède and Roussillon, in both directions (Coste 2021). Peyrepertuse and Le Castellàs were not part of the same jurisdiction as Saint-Pierre and, as far as we know, there is no evidence to suggest that they specialised in wool production. In the case of Le Castellàs, for example, we know that the village of Montailou specialised in cross-border pastoralism, but that textile production was only local or even domestic in scope (Le Roy Ladurie 1985). It was therefore quite possible for the castle's inhabitants to have animals of various ages at their disposal, without having to set up a specific supply system in order to obtain quality meat. That said, the practices at each site remained very stable over time between the feudal and royal periods, suggesting that the crusade had little effect on cross-border activities, whether pastoral (with trans-Pyrenean transhumance from Castellàs/Montailou) or commercial (with the possible import of sheep to Fenouillet). It also suggests that, on all three sites, the supply networks were maintained unchanged during the transition to the royal period. Isotopic and biometric studies, currently underway, may shed light on the origin and evolution of these animals, as well as the role of cross-border trade in the animal economy of south-west France.

Unlike for cattle, that appear to have been bought occasionally, resulting in very isolated portions of individuals, caprines were almost entirely consumed *in situ* at the three sites. At Saint-Pierre, the complete skeleton is present, but there has been a change in the frequency of the leg: very present during the feudal period, the proximal segment of the leg, corresponding to the femur, diminished sharply from the early royal period onwards, while the shank is maintained. At the same time, there was a gradual increase in fragments from the shoulder region. This change in preference may be linked to the change in status of the occupants. The garrison was able to maintain the supply chain that was already in place, and which provided good quality meat from butchered animals, but may have replaced the purchase of leg with shoulder. In this case, this means that their supply method allowed them to select the cuts and that they were not buying generic meat (Petrowiste 2018). Given the fact that femur is the most profitable element in this species, its low frequency could also indicate that the legs were boned more often from the early royal period onwards. This is certainly the case with vertebrae, in all species and all settlements. The feet of caprines, on the other hand, seem to have been removed and not eaten at Saint-Pierre and Peyrepertuse. This was common practice at the time and for this species in the south of France (Unsain 2021). At Le Castellàs, most of the skeleton is preserved, but with the exception of the vertebrae and femurs, which were largely under-represented throughout the site's occupation. The ribs, on the other hand, appear to be present. The royal period provided the most

material. At that time, caprines seemed to be consumed for their meat, bone marrow and bone fat. The constant under-representation of the femur could, as at Saint-Pierre, indicate that the legs were almost systematically boned, like the vertebrae. This could therefore be a local custom, which has also been identified for pork in Provencal castles (Unsain *et al.* 2023a).

At Le Castellás, the cutting of sheep and goats was almost exclusively carried out using blunt blows to open the diaphyses and gain access to the bone marrow and fat. Knife marks are very rare and the use of a cleaver has been identified on only two occasions out of the three phases. These differences compared to beef could be due to the bones being easier to fracture in smaller animals. However, Peyrepertuse and Saint-Pierre produced very different results. The use of cleavers and blunt percussion were regular, and the cuts were consistent between the different occupations. Le Castellás stands out very clearly, perhaps because it is more isolated from the large towns where the butchers worked. Could this be due to a difference in supply, with a mountain site on the one hand, specialising in pastoral activities, and on the other, sites on the plains, largely connected to trade with the big towns and where supplies were easier? In reality, Montailou was not isolated; shepherds used to visit the sheep fairs in Ax-les Termes, on the neighbouring ridge to the south, and especially Laroque d'Olmes, a little further north (Le Roy Ladurie 1985). In terms of daily supplies, on the other hand, it is possible that the local population relied mainly on their own production. We know, for example, that the inhabitants of Montailou paid the Count of Foix, who owned the castle in the royal period, and then the King of France in the modern period (and perhaps even the *Faidit* lords) grazing and forestry rights to keep their flocks of sheep on the estate land (Le Roy Ladurie 1985). The presence of a local butcher was therefore perhaps of little use, as the inhabitants could travel from time to time to neighbouring villages to obtain beef. The castle's occupants could have bought sheep from the village and had them butchered, not by a professional butcher, but by a local or someone else with the necessary skills. In this way, the non-commercial purpose of the cutting (not the meat itself) could justify the differences observed between Montailou and the other sites studied. To conclude on Castellás, it is important to stress that, paradoxically, the impact of the Albigensian Crusade boosted trans-Pyrenean relations. Around 1305–1308, inquisitors undertook to cut off a 'Cathar route' that enabled herds to travel between the south of the Ariège and the pastures of the Agly, near Perpignan (Le Roy Ladurie 1985, 162). Far from discouraging transhumance, this measure developed existing links with Catalonia, where the herds were sent. In Montailou, the herds that had been wintering on the Roussillon border were instead sent to Iberian lands around Barcelona and Tarragona.

### **Pig supply strategies**

The pig is the only animal bred exclusively for food (Durand *et al.* 1997). Slaughtering generally takes place at around two years of age, when the animal has reached its optimum weight and the meat can be processed for long-term preservation (Vigne 1988; Horard-Herbin 1997; Woolgar *et al.* 2006; Albarella 2007; Fercoq du Leslay and Lepetz 2008; Blaise 2010). The slaughter of younger animals, on the other hand, corresponds to a search for very tender meat to be eaten fresh (Unsain 2021). On the sites studied, the supply is mainly directed towards adults aged two to three years (Fig. 14.7). Individuals aged four and over are rare when they are not absent. On the other hand, juveniles under one year old are fairly common and evenly distributed between the occupations, accounting for around 30% of the population. This is one of the few elements that is consistent with the elite status of the sites. However, as with the caprines, the age at which pigs were consumed at Le Castellás in the late Middle Ages appears to have been lower than in earlier periods. More specifically, we note the disappearance of young individuals, perhaps because they provided too little meat, suggesting a focus more on the quantity than quality of the meat. These results are therefore compatible with the hypothesis formulated above on the impact of the 14th century crises on food supplies.

Pig rearing and, above all, pig slaughtering are often domestic affairs, with the result that pork is generally under-represented in butchers' accounts (Stouff 1970). In Montailou, pork was commonly eaten by villagers, mainly in salted form. Neighbours helped each other to smoke the meat, with the sharing of fireplaces (Le Roy Ladurie 1985). At the castle, the consumption of salted or smoked meat is quite likely, since the animals were mainly adults, as in the other castles studied. We might expect an increase in these products in the garrisons, as they are easy to transport and prepare, and can be kept well. However, the proportions of adults and young pigs were very stable between the feudal and royal periods. Nevertheless, it is difficult to estimate the proportions of salted and fresh meat, or to attest to the practice of salting and smoking. One of the rare signs of such practices is yet very present: the under-representation of the femur (Le Blay 1993), which had already been reported for caprines. At Saint Pierre, femurs, which were already scarce during the feudal and early royal periods, disappeared completely during the royal period. At the Castellás, the same phenomenon was observed at the same time, while at Peyrepertuse, where only the royal period is available, the femur is almost completely absent. It is very difficult to determine whether this means that the *Faidit* lords, unlike the garrisons, had access to hams, reflecting their privileged social status, or whether, on the contrary, we are witnessing an increase in the preparation of boned ham. In this case, the ham could still be consumed by the garrison, without leaving any trace. These issues have been



discussed extensively for medieval Provence, and local textual sources have been essential in gaining a better understanding of this phenomenon (Unsain *et al.* 2023a). In this case, we know that hams could be taxed by the lords, either to butchers or to farmers (Le Blay 1993; Petrowiste 2018). The collection of these duties may have ceased at the end of the Albigensian Crusade, but we also know that other duties and taxes were perpetuated during the royal period, in particular land use rights (Le Roy Ladurie 1985). Perhaps the hams were still taxed, but they did not arrive in the garrisons that occupied the three castles, but by the lords who took control of them. This is also the hypothesis adopted for the Provençal case.

### **Equids**

The Castellás mountain site (1354m.a.s.l.) is the only site where equid, and more specifically donkey remains, have been identified. Although these finds are very scattered, it is possible that their discovery on a mountain site is linked to the use of these animals to carry goods. The latter, along with the mules, are widely mentioned in Montañou's textual sources (Le Roy Ladurie 2006; Coste 2021). They were used, for instance, to import wine (from Tarascon, near Montpellier, and Pamiers, closer by), sea salt (essential for pastoralism) and olive oil. These animals were essential in cross-border mountain areas and generated a flourishing two-way trade: there is mention of both mules and horses bred in Catalonia and Roussillon and then exported to the kingdom of France, and, from the second half of the 14th century, the substantial arrival of these animals from the south of the kingdom of France to Elne and Girona. The isotope studies currently underway will be crucial in shedding light on the origins of Montañou equids and the trade networks in this cross-border context.

### **Small livestock**

The remains of small livestock consist almost exclusively of hens, in all contexts. However, according to the remains identified, these poultry would have made a largely secondary contribution to the meat diet, with only a few individuals. In addition to their meat, these birds also provided eggs. Poultry is a widely farmed animal, even in urban areas (Cotté 2008). It is therefore possible that a few individuals were kept directly on site and consumed from time to time.

### **Hunting**

Among the small animals hunted are rabbits, hares, geese, ducks and partridges. Apart from hares and partridges, the status of these species is generally unclear, as they may be either domesticated or wild animals. One of the methods used to assess the status of these species is to compare their frequency with that of clearly domestic species (usually hens) and clearly wild species (such as hares or partridges) (Forest and Rodet-Belarbi 2011). In all the contexts studied

here, the proportions of these animals are always similar to those of wild animals and are therefore considered to have been hunted. These small catches are extremely occasional (although some may not have been identified due to the limits of the reference collection) and must not have had any real nourishing function. Geese were present only at Saint-Pierre, during all three occupations. It is accompanied by the only duck remains identified during the study. Perhaps these animals were hunted in the streams bordering the castle. These water birds are completely absent from the other two sites.

Large wild mammals are also very poorly represented. The bear is probably the most common species. It was found at Le Castellás during the royal period, and at Saint-Pierre during the feudal and royal periods. Based on the present study and the observations of Forest (unpublished), it seems that these remains come mainly from taxes taken by the lords from the bear's paws, from the recovery of the skin, or from hunting pests, particularly cubs. There is no evidence to suggest that hunting was directly practised by the occupants of the castles. However, there is some evidence to suggest that bear meat was eaten at Saint-Pierre, in particular, the leg. Medieval sources attest to the consumption, trade and even taxation of bear meat in the Middle Ages (Forest 1997; Carrier and Mouthon 2010; Lignereux 2011). The presence of this species in the region is known from two other sites, also in the Pyrenees: Usson castle, already mentioned, and the Landorthe motte, where its consumption is clear (Rodet-Belarbi and Forest 2008).

At Le Castellás, red deer made a furtive appearance during the royal period, with single remains. At Saint-Pierre, it provided a few quarters of meat shared between the early royal and royal periods. Finally, only one remains from Peyrepertuse. This is a fragment of crafted antler which has no connection with the diet. Roe deer are generally less well represented than red deer (Forest and Rodet-Belarbi 2011); a dental fragment was found at the end of the Middle Ages at Montañou, and only the remains of phalanges at Saint-Pierre, possibly more related to the recovery of the skin than to the consumption of meat.

Le Castellás during the royal period, as well as the various phases of Saint-Pierre, yielded a certain diversity of wild species. Despite this, most of the contexts studied here have yielded very low proportions of wild animals, generally between 0.7% and 2.6% of the NISP. Only the first and last phases of Saint-Pierre have higher proportions, around 4.5% to 5%. As a comparison, the castle of Montségur (13th–15th centuries) reached 5%, which is common for this type of context (Lignereux 2011). These rates therefore confirm that hunting was extremely sporadic, both on the plains and in the mountains, from the feudal to the royal period, which is quite surprising, especially for rural sites where consumption of wild animals, although rarely substantial, was often common (Durand *et al.* 1997; Bord and Mugg 2008).

## Conclusion

To conclude, this contribution is based on the faunal remains discovered at three castles before, during and after the Albigensian Crusade (13th–14th centuries). The data reveals a high degree of homogeneity in eating habits, not only between sites, but also between different periods, reflecting a significant degree of resilience on the part of farmers, but also consumers and the commercial network. The most important animal group for consumers were caprines (especially sheep). Their economic importance varied from site to site (subsistence economy, wool industry, animal trade), which impacted the quality of the meat consumed. Cattle, on the other hand, were almost always reared for their meat and had to be purchased occasionally. In general, the results do not fit in well with what we find for elite sites, whether in the feudal or royal period (few young individuals, very low proportions of hunted species). The general trend of declining use of pigs' hind legs (and therefore ham) during the royal period nevertheless seems to mark a distinction between the *Faidit* nobles and the royal garrisons. In Saint-Pierre, it seems that the commercial networks for the supply of caprine meat, developed by the local lords, were preserved during the royal period. It also appears that this trade linked the region to the other side of the Pyrenees' border. By cross-referencing zooarchaeological data with the work of historians, it has become clear that this border was completely permeable to people, herds and goods. Most of the sites studied had close links with the Trans-Pyrenean lands. These long-standing links were even strengthened following the Crusade, contributing to the homogenisation of patterns observed in meat consumption. Finally, the few results from the late Middle Ages seem to reflect the economic and sanitary troubles that affected Europe in the 14th and 15th centuries. The various hypotheses can soon be further tested by the isotopic and biometric analyses currently under way.

## Acknowledgements

Figures representing skeletons are from the templates provided by © 2013 ArcheoZoo.org/Michel Couteureau (Inrap) from: Helmer, D. (1987) *Fiches descriptives pour les relevés d'ensembles osseux animaux*. In J. Desse and N. Desse-Berset (eds) *Fiches d'ostéologie animale pour l'archéologie*, Série B : mammifères, no. 1. Juan-les-Pins, Centre de recherches archéologiques du CNRS/APDCA and from © 2013 ArcheoZoo.org/Michel Couteureau (Inrap), Vianney Forest (Inrap), from Barone, R. (1976) *Anatomie comparée des mammifères domestiques, Tome I Ostéologie – atlas*. Paris, Vigot; and © 2003 ArcheoZoo.org/Michel Couteureau (Inrap) from: Pales, L., and Garcia, M. A. (1981) *Atlas ostéologique pour servir à l'identification des Mammifères du Quaternaire – Carnivores/Homme*. Paris, CNRS éditions.

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## Notes

- 1 We would like to thank V. Forest (zooarchaeologist at the Institut National de Recherches Archéologiques Préventives, division Méditerranée) and the site's research director, David Maso (Acter archéologie), for kindly making 1999 and 2003 data available.
- 2 Coutureau, Forest, INRAP, 1996, archeozoo.org.
- 3 For instance, the QSP of the skull is 1, that of the femur is 2.
- 4 The thorax was not included in this study as it has not been identified taxonomically.
- 5 Meat:  $p = 0.819$ ;  $\rho = 0.038$ . Bone fat:  $p = 0.969$ ;  $\rho = -0.006$ . Bone marrow:  $p = 0.354$ ;  $\rho = 0.156$ . MGUI:  $p = 0.485$ ;  $\rho = 0.118$ .
- 6 Density:  $p = 0.978$ ;  $\rho = -0.004$  and SFUI:  $p = 0.771$ ;  $\rho = 0.044$ .
- 7 Here, sex was determined on the basis of the absence of dewclaws spurs on the tarsometatarsi.
- 8 This thesis project aims to reconstruct the role of fish in medieval and modern diets in Provence, as well as the impact of human activity on landscapes through fish farming. André forthcoming.
- 9 Glossary: Bones: generic name for spines, axonostes and lepidotriches. These bones make up the dorsal, pelvic, anal and caudal fins. 'IND': number of undetermined remains; 'NRR': number of remains collected; 'NRDa': number of anatomically determined remains; 'NRDaR': number of anatomically determined remains reduced. It corresponds to NRDa after excluding scales and 'bones'; 'NRDt': taxonomically determined number of remains. They can be attributed from the least to the most precise to a family, a genus and a species.
- 10 The measurements taken on the vertebrae are valid for all fish and are defined as follows: M1 Maximum height of the *centrum*; M2 Maximum width of the *centrum*; M3 Maximum

anteroposterior diameter (DAPmax) of the *centrum*. However, only certain vertebrae are eligible for the size and mass restitution method, depending on their position in the rachis and the published standard calculation formulae (Morales and Roselund 1979; Lepiksaar 1981).

- 11 Only part of the material from red deer (*Cervus elaphus*) was available for study. For example, Forest mentions in his report a fragment of antler that was not found during this study (Forest unpublished).
- 12 Forest (unpublished) counted 28 bear specimens in 2003, of which only 12 were recovered in the present survey. However, the trends observed are similar between the two analyses.
- 13 Peyrepertuse castle has not been included because the age data for the cattle is too imprecise.

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## **PART 4: SYNTHESIS**





# The impact of shifting frontiers, conquest and cultural transformation in medieval Iberia and Occitania

*Aleksander Pluskowski, Michelle Alexander  
and Guillermo García-Contreras*

## Introduction

The chapters in this book have provided a range of multi-scalar perspectives on the impact of frontiers being created and shifting, following periods of state expansion in the medieval western Mediterranean. This was associated with population movements – both colonisation and displacement – the physical imposition of seigneurial relationships and the annexation of land (Torró 2019). Both ‘frontier zones’ (borderlands) and ‘frontier societies’ (polities defined by territorial annexation with composite societies) have been investigated (Berend 1999).

The durability of borderlands varied, but in the case study regions included within this book there was usually a period of stability that resulted in a discernible settlement pattern and related modes of environmental exploitation. Together, these shaped distinct cultural landscapes. Our approach has been to compare these and their related features before and after the Christian conquests of the modern provinces of Guadalajara, Lleida and Andalusia, with additional data drawn from other regions, and before and after the French annexation of eastern Occitania. In the case of Guadalajara, the northern Andalusi frontier emerged in the 8th and 9th centuries and did not shift significantly until the 11th century. The newly defined Christian territories continued to share a southern frontier with Andalusi lands until the early 13th century, during which time eastern borderlands between Castile and Aragón had also formed. In the Lleida region, also part of the upper frontier of al-Andalus, the early centuries of Arab/Berber occupation are poorly attested, although 9th- and 10th-century written sources refer to a network of fortifications. Dense settlement only becomes visible south of Christian territories in the early 11th century. Christian state expansion in this region continued through to the mid-12th century. In the southernmost part of al-Andalus, the

frontier with the Nasrid Emirate was formed in the early 13th century and incrementally shifted in parts of its western side in the mid-14th and early 15th century, but then did not significantly move until the 1480s, with complete annexation in 1492. The French-Aragonese frontier across the eastern Pyrenees was formed in the mid-13th century and remained static until the second half of the 17th century.

The archaeological, historical and environmental data presented in this volume are unevenly represented both temporally and spatially, and some analyses have focused in detail on particular regions. Individually, they provide key interpretative frameworks that can be further developed and tested with future research, whilst together they establish new baselines for comparative frontier studies in the medieval western Mediterranean and beyond. This chapter brings together the data presented in the volume’s thematic chapters, and provides a comparative synthesis of frontier societies in medieval Iberia and Occitania. It offers the first integrated synthesis of political, environmental and cultural transformations across multiple medieval frontiers, combining settlement archaeology, palaeoenvironmental reconstruction, stable isotope analysis and architectural survey with historical analysis (see Chapter 2). Furthermore, by bridging the historiographies of Iberia and Occitania, and foregrounding the long-term cultural and environmental impacts of conquest, it contributes to ongoing debates on cultural resilience, hybridity and the material imprint of state formation in post-conflict societies (Newson and Young 2018).

## Frontier dynamics

The medieval frontier dynamics of the case study regions of Guadalajara, Andalusia, Lleida and the French eastern

Pyrenees are summarised below in relation to this study's key research questions introduced in Chapter 1.

### ***1. How was the political landscape of the frontier shaped?***

The political landscapes of Iberian and Occitan frontiers were fundamentally reshaped through a combination of military conquest, legal codification and the spatial imposition of the new regime's authority. In Iberia, key instruments of this transformation were *fueros* and *Libros de Repartimiento*, which provided settlers with legal frameworks while delineating new jurisdictional and property boundaries (see Chapters 4 and 11). Although historiography has emphasised political and military administrative divisions shaping the external borderlands of medieval Iberian and French polities (see Chapter 1), the boundaries of any given sovereign territory were ultimately established by its resident peasants and the location of their settlements (Leveau and Palet Martínez 2010). There were examples where fortifications represented the furthestmost settlement of a given polity and so marked the frontier (or at least claims to territory) at that particular point in the landscape, for a defined period of time. However, the majority of fortified sites which often emblemise historical borderlands, especially from the perspective of cultural heritage in southern France, Spain and Portugal, did not *sensu stricto* define its limits in terms of settlement or use of the landscape. Serving as residences for representatives of the state and their garrisons, they did nonetheless have far more important value as administrative centres, as nuclei for settlements, especially towns, and as symbolic architectural expressions of claims to territory and evolving social hierarchies on the frontier. Drawing on the data collected in this book, several trends become apparent which reflect changing political contexts and in particular the growing importance of centralised authorities.

In the upper frontier of al-Andalus, both in the territories of Lleida and Guadalajara, local Berber lineages held considerable autonomy and often navigated alliances with both the Umayyad Caliphate and neighbouring Christian lords. Here the early medieval frontier was porous – defined not by fixed borders but by contested zones of influence – and permeable to trade, diplomacy and warfare. Starting with the case of Guadalajara, the first phase of Andalusi settlement saw the construction of numerous towers by peasant communities within the frontier zone. Rather than oriented northwards towards Christian territories, these were instead associated with agricultural areas. The region was governed by autonomous Berber groups, but in the late 8th/9th century, there was a shift in the principal fortified centre at the frontier, from the hilltop of Padrastró to Atienza, some time before the impact of the Umayyad Caliphate on the militarisation of the borderland became visible in the early 10th century. Perhaps this reflected the military threat from the North. Fortified Atienza served as a mustering

point for campaigns across the borderland, as well as a centre for collecting taxation. In its final phase, it became the principal frontier outpost of the Taifa of Toledo, and following the Christian conquest in 1085 the castle became the military focus for the new regime. With the gradual southwards expansion of the Castilian frontier, acquired territories were reorganised into episcopal lordships and seigneurial domains, accompanied by the creation of new political centres. For example, in Sigüenza in 1124, a centre of power was established by the new episcopal elite over a previously scattered rural settlement, while at the same time a somewhat legendary memory was being constructed about the 'reconquest' and repopulation of a territory that had been under Islamic control before the 12th century.

Andalusi activity within the fortified complex of Molina de Aragón is visible from the 10th century, and in the 11th century it may have functioned as the centre of the Taifa of Molina. With the Christian conquest in 1129, Molina became a more clearly defined administrative, military and economic hub overseeing a network of fortified sites, villages and resource areas. The *Fuero de Molina* not only regulated land use and irrigation but inscribed a new social and legal order into the landscape. The political landscape of the new lordship was configured by the actions of the Lara family, who invested in significantly expanding the castle of Molina as well as constructing or remodelling fortifications in other parts of the lordship. The use of similar building materials with a consistent colour scheme in some of these fortified structures, including Molina's town walls, emphasised the family's branding, and was a clear architectural statement of authority (Fig. 15.1). The frontier shifted several times, and ultimately the efforts of the Lara family became focused on fortifying the eastern borderland with Christian Aragón, and the main routeways around Molina (see the distribution of castles in the lordship in Fig. 15.6). The karstic landscape of the southern part of the lordship remained a natural frontier and was not fortified in the same way. This wilderness was characterised by deep gorges, cavern systems, springs and mountains, serving as an attractive location for monastic communities, who in turn established hermitages in even more remote areas (Figs 15.2 and 15.3). These monasteries were deliberately established with the patronage of Castilian monarchs, the Lara family and the aid of French monks, reflecting a deliberate policy of encouraging migrants to repopulate the conquered lands. Castles continued to play an important political and military role, and military provisioning is evident from food refuse at Molina de Aragón (see Chapters 7 and 8). The military orders also played a prominent role in the governance of frontiers in Iberia, which is particularly visible in the province of Guadalajara where the Templars, Hospitallers and the orders of Calatrava and Santiago were granted properties after the incremental conquests. Not all estates were borderland lordships, for example the Templars held land in the central parts of



*Fig. 15.1. The castle walls of Molina de Aragón showing how red sandstone was used to pick out the edges and create a visual brand that is also found in the town and other structures sponsored by the Lara family*

Molina's lordship, whilst the Order of Calatrava was most closely associated with the frontier landscape along and around the Tajo river (Fig. 15.4).

In the territory of Lleida, the frontier zone was dotted with rural forts that defended strategic routes, rivers and fertile plains, with many constructed or upgraded during the 9th–10th centuries. As frontier tensions with neighbouring Christian polities escalated, the fortifications of towns like Lleida, Balaguer and Tortosa were also reconstructed. Again, the irregularity in their construction, using techniques like mixed ashlar and rammed-earth constructions (*tapial*), reflected local autonomy from centralised state control and pragmatic adaptation to local conditions. The movement of the frontier was associated with the conquests of the fortifications and urban centres; the Segre valley was conquered during the early 11th century by the counts of Urgell and Barcelona. These two Christian powers essentially competed with each other for territory, and established fiefs centred

on castles to create new political landscapes with different spheres of influence. Following the Christian conquests in the early 12th century, with Balaguer captured by the Count of Urgell in 1105, the political landscape was transformed into feudal lordships, where territories were divided amongst nobles, ecclesiastical authorities and military orders. Castles became administrative centres of these new districts, and as in Guadalajara a number of Andalusi fortified sites were reused or remodelled, with several examples exhibiting transitions in construction technique (see below). These were supported by institutionalised military colonisation and the establishment of new dioceses, turning a previously dynamic frontier into a structured, stratified feudal domain.

In the southern part of Iberia, the north-western frontier of the Nasrid emirate became defined by a militarised border over the course of the 13th century, marked by castles and a series of towers that guarded the mountain passes into the Vega of Granada (Fig. 15.5). On the other side, Castilian





Fig. 15.2. The Hoz canyon in the Gallo river, within the Molina and Alto-Tajo UNESCO Global Geopark, Guadalajara (José Felipe Ortega, Wikimedia Commons)

castles and towers encircled the frontier. Following the incremental Castilian conquests in the 14th and 15th centuries, there was further investment in castles which now functioned as centres of governance for the annexed territories, as well as towns, whilst migrants established villages and *cortijos* (see below). With the shifting of the frontier, the smaller towers lost their strategic importance. Transformations were also ideological as well as administrative: frontier landscapes were sacralised through the construction of churches and redefined through symbolic acts such as renaming or restructuring urban centres. Ultimately, the political landscapes of Iberian frontiers became a visible palimpsest of conquest, colonisation and administrative reorganisation, defined not only by territorial acquisition, but also by the codification and materialisation of Christian rule through law, architecture and spatial planning.

In the case of the Occitan eastern Pyrenees, the creation of an official border in 1258 transformed the earlier mosaic of semi-autonomous territories with vassalage ties to their larger neighbouring states, into a broad frontier between two Christian kingdoms. This became defined, above all, by a militarised borderland. The imposition of French royal

authority was accompanied by the introduction of a new, structured administration which initiated a systematic programme of remodelling strategically important castles to house garrisons. Archaeological differences between elite feudal occupation and royal garrison phases are visible in faunal assemblages, reflecting the logistical needs of a state military presence rather than elite domestic consumption (Chapter 14). The defence of the frontier became reliant on a small number of royal garrisons, rather than local communities, although several castles within the borderland such as Puivert came under the ownership of French noble families who rebuilt them as seigneurial residences, rather than as fortresses with purely military functions (Mention 2005). The design of these private castles was inspired by those in the Île-de-France and by the royal architectural programme in the Corbières, reflecting the influence of the Capetian monarchy. Carcassonne not only became the new French crown's principal administrative and military centre, but also served as a regional model for architecture (Bayrou 2013). The post-Crusade royal construction programme contributed to projecting the power of the French crown in the annexed lands. The varied forms of the royal fortresses

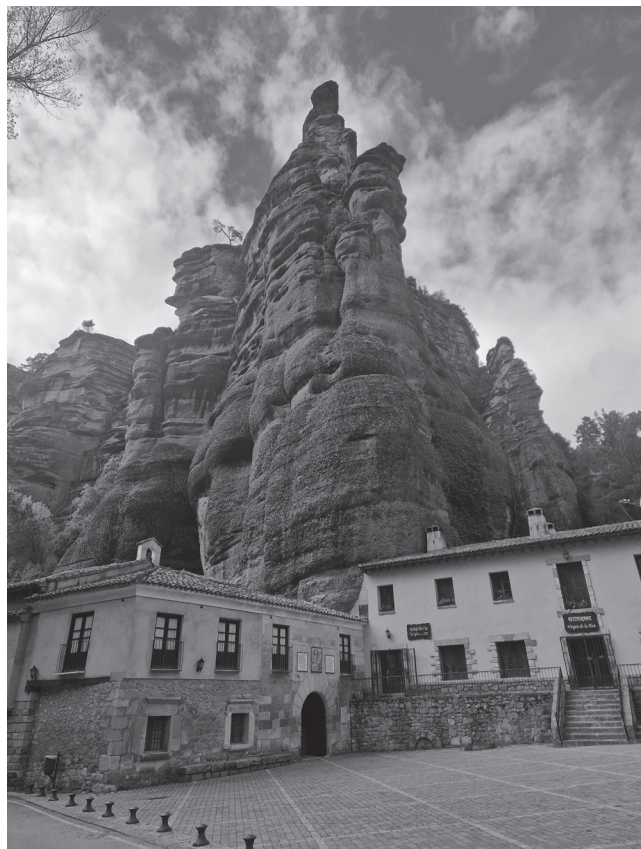


Fig. 15.3. The hermitage of the Virgen de la Hoz, Ventosa, within the Molina and Alto-Tajo UNESCO Global Geopark, Guadalajara

reflected necessary adaptations to local topography, but in all cases the natural advantages of the site were fully utilised and earlier constructions were incorporated where this was possible. Those castles built on relatively level sites such as Puivert, Quillan, Arques and Lagarde followed strict geometric principles of design, unhindered by the topographic constraints (Mention 2005, 389). The militarised nature of the frontier is particularly evident with the shifting of the border in 1659, when a number of the castles were abandoned, no longer serving a strategically useful role.

On the other side of the border, Aragonese rulers also invested in militarising the frontier, but this did not involve a cohesive programme of construction. Castles were constructed or remodelled, along with a series of sentinel towers, and French building traditions were even imported, as indicated by the design of the castles at Olette and Llivia, but overall their heterogeneous design indicates the absence of a single, cohesive architectural programme. Differences in investment are also reflected in the procurement of construction materials. In contrast to sourcing materials for Peyrepertuse and Quéribus from relatively distant quarries, and utilising well-cut ashlar, the castles of Opoul-Salvaterra and Puyvalador used locally obtained, roughly hewn stone. Whilst the defence of the

French borderland relied on professional garrisons, on the Aragonese side, as evident at opposite ends of the frontier – at Opoul in the west and Llivia in the east – local communities were leveraged to defend the borderland initially through the use of charters, and then through *recolleta*. In this way they became liable for contributing to the upkeep of these fortifications, reducing the costs for the Aragonese monarchy. These differences can be interpreted in terms of relative state capacity, economic strength and administrative centralisation between the governance of the two frontier regions straddling the eastern Pyrenees. The Catalan–Aragonese kings did not have the means to invest in a comparable programme of militarisation.

## 2. How is the frontier reflected in long-term changes in settlement and social organisation?

The impact of frontier dynamics – creation and movement – are broadly comparable across the Iberian regions included in this study, but differ in some respects in the eastern Pyrenees. In the case of Guadalajara, the initial wave of colonisation saw Berber migrants reuse earlier hilltop sites, with some continuity in existing valley and plain settlements into the 9th century. Then in the 9th and 10th centuries, new rural sites were established with associated small, irrigated fields. To the north in the broad frontier zone there is no evidence for a stable settlement pattern; however, even when the borderland was more clearly defined in the 10th century it was never a solely militarised and empty landscape. The highest density of settlement by the frontier was found around Atienza, the regional centre. Here, and indeed elsewhere in the region, there is a recurring link between Berber settlements (particularly *alquerias*) and irrigated spaces, valleys and salt flats. Viewshed analysis of castles and towers in this region indicates they were connected with productive spaces, rather than the frontier. Traces of Christian (i.e. Mozarabic) communities are present, but remain ephemeral.

Following the Castilian and Aragonese conquests of the region, there was a complete replacement of the rural settlement pattern (Fig. 15.6). In this respect the 12th century represents a hiatus, a shift from small scattered rural settlements dependent on fortified centres, linked to local elites, to concentrated villages dependent on walled towns and capitals of lordships. Andalusi communities fled, were removed or concentrated in a small number of urban *moreries* in towns like Molina and Alcalá de Henares. The incoming migrants occupied more dryland areas, although in some cases irrigation systems were adopted and expanded, as in the case of Molina itself. The introduction of a feudal economy designed to produce a surplus for tithes and taxation saw the intensification of agricultural production (see below). Moreover, although it is currently difficult to assess its real demographic impact, we should not overlook the fact that the new elite who administered part of the territory in northern







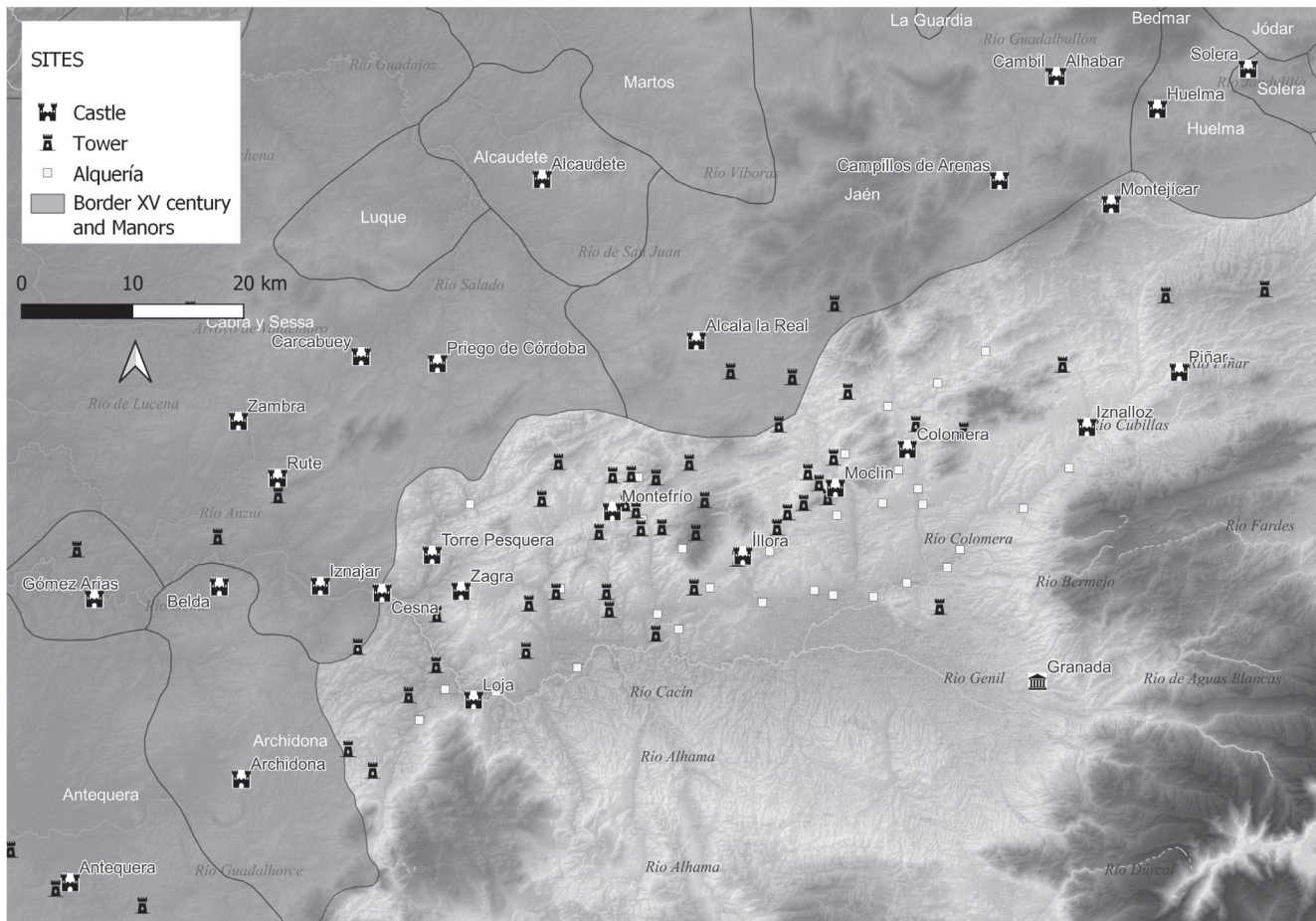


Fig. 15.5. The north-western frontier of the Nasrid Emirate of Granada, showing the settlement pattern and military sites on the Nasrid side of the borderland

the towns located on the banks of the Ebro and the Segre rivers, between Lleida and Tortosa.

In the case of the Nasrid Emirate, there is a similar shift in the settlement pattern that is visible in the late 15th and 16th centuries (Fig. 15.7). Here it is evident that Andalusí *alquerías* and Castilian *cortijos* were located in different areas; again, the latter favoured more dryland sites where woodland was cleared to expand the cultivated area on marginal land. In some areas, rural Andalusí communities remained in place and became defined as Mudejars, and eventually as Moriscos.

Despite the brutality of the Albigensian Crusade and the socio-psychological effects of inquisitorial activities (Given 2001), the broader impact on the conquered population was comparatively minimal. The region experienced an economic revival with evident phases of prosperity, visible in both the region's large and smaller towns. The second and third generation of French lords, who inherited the vast estates seized during the Albigensian Crusade, became heavily invested in developing their lands. They founded bastides,

designed to stimulate trade and commerce. The region's ecclesiastical infrastructure remained intact, and monasteries also played an important role in founding planned towns. The confiscation of feudal properties belonging to *Faidit* lords represent the most immediate impact of regime change. These castles had associated settlements, as well as broader territories for which they fulfilled the functions of political, economic and – where parish churches were present – religious centres. Previous archaeological and architectural studies have largely focused on the castles, and the associated settlements are poorly known archaeologically. Yet there is enough evidence to suggest that some castral villages endured into the 14th century (Baudreu 2010). More broadly, demographic changes in the eastern Pyrenees are visible only in the second half of the 14th century, when the rural settlement pattern noticeably shrinks. Desertion of villages varied across the region, with significant differences on either side of the Aude valley and in the high Pyrenees, as with the case of Vallsera. In areas with a higher density of settlement in the 13th century, depopulation can be linked





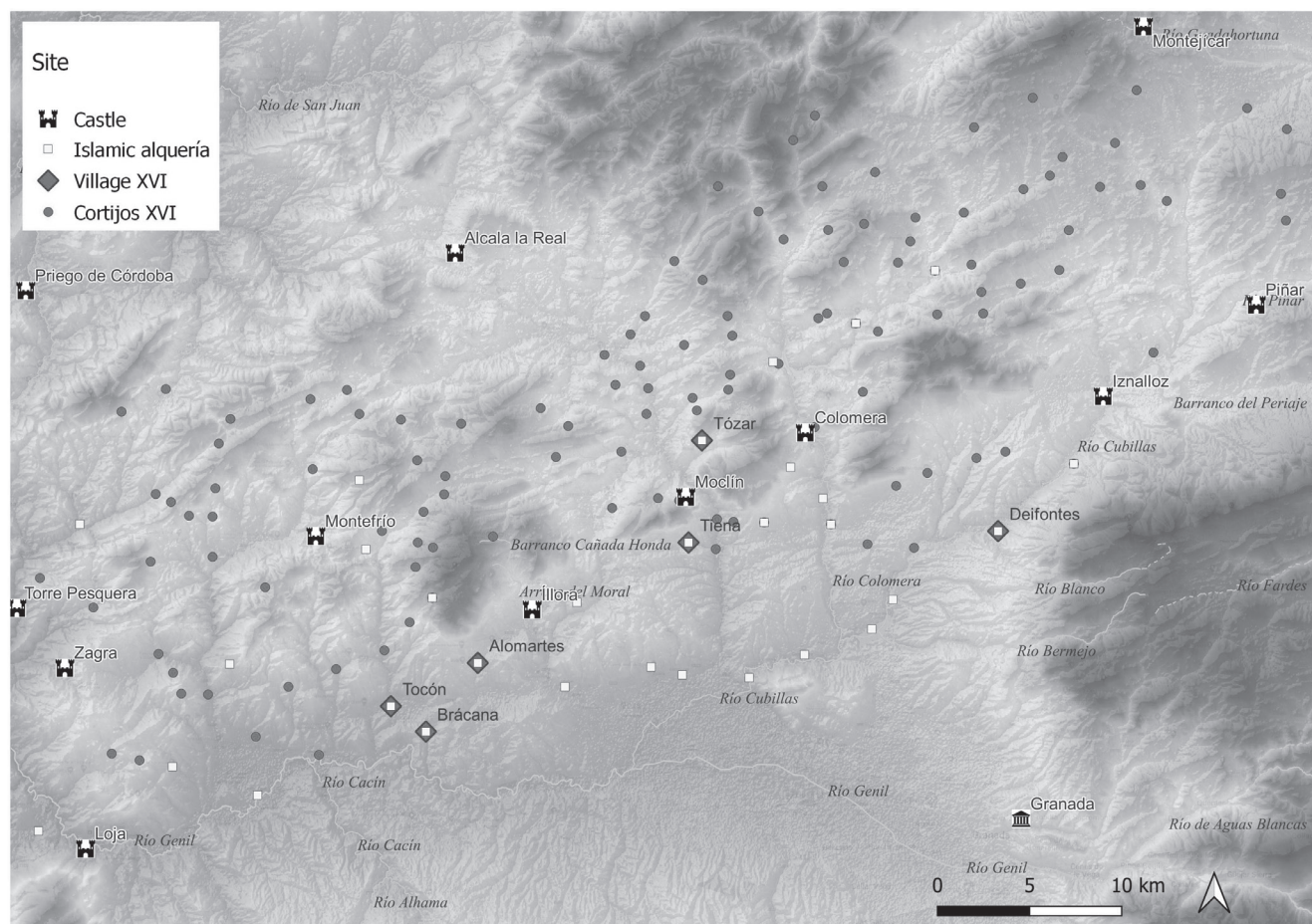


Fig. 15.7. The 16th-century settlement pattern in the former north-western frontier zone, following the conquest of Nasrid Granada

the first phase of Arabic-Berber migration, or whether existing crops were adopted by Andalusí peasants. It is evident that the Andalusí agricultural base as it developed did not vary between political heartlands and the shifting frontiers (Peña-Chocarro *et al.* 2019). Possible influences across the frontier may be visible in Guadalajara, where the Andalusí population used a similar diversity of crops to that in neighbouring Aragón or Catalonia during the same period, with an agricultural base supplemented by rye and proso millet. In contrast, the majority of ‘novelty’ species can be tentatively associated with Andalusí political heartlands, namely the southern and south-eastern parts of al-Andalus, including the Málaga region. Their chronology can be linked to the rise and expansion of the Almoravid Empire, which also saw fluctuations in the Iberian frontier with Christian territories. The integration of southern Iberia into the Almoravid Empire may have contributed to the spread and dissemination of key economic plants along trade networks that connected North Africa with al-Andalus. Their absence from adjacent Christian territories is more likely to suggest biases in the surviving data, rather than the impermeability of the frontier.

More noticeable changes are evident with long-term trends in animal husbandry (see Chapter 7). The early Andalusí period is characterised by a visible decline in pig rearing and pork consumption which is evident in both political frontiers and heartlands. Interesting exceptions may include Mozarab communities, and these are increasingly the focus of archaeological research. Conversely, there is evidence for the persistence of Andalusí husbandry and culinary traditions by Morisco communities following the Castilian conquest of the Nasrid Emirate, as clearly visible at Cartuja (García *et al.* 2021). These focused on the intensive rearing of sheep and goats, a trend that is visible across al-Andalus. High  $\delta^{15}\text{N}$  values in the diet of livestock, particularly sheep and cattle, can be linked to the corralling of livestock near settlements to facilitate manure collection, and foddered with agricultural products. These practices were not discontinued, as evident from high-status Castilian contexts at Alcázar Real de Guadalajara, which had some of the highest  $\delta^{15}\text{N}$  values for sheep in the Guadalajara province. At the same time, they exhibited a wider range of  $\delta^{13}\text{C}$  values, suggesting access to a broader catchment area,



consistent with the provisioning of livestock to a high-status community (see Chapter 8). Yet, there is also evidence for regional specificity in husbandry practices. The common addition of  $C_4$  crops such as millets and sorghum to the diets of domestic animals evident at other medieval sites in Iberia, particularly in the regions of Valencia and Asturias, was largely absent in Guadalajara.

Interestingly, the carcasses of caprines were processed in small centres close to consumers during the Andalusi period, with a noticeable shift following the Castilian conquests of Guadalajara and Granada, where there is evidence for specialised supply centres that favoured those cuts with the greatest meat yield. Again, this mirrors the centralised and intensified approach to the management of the landscape following the conquests. Sheep rearing intensified during the Andalusi period in Iberia, as it did in Islamic Sicily, and there is evidence for both ‘improvements’ in the Christian period, as in the case of the high-status Castilian contexts in Alcázar Real de Guadalajara, and continuity, as evident from the faunal assemblage associated with the Jewish community in Molina de Aragón. Livestock herds moved through the frontier; this is particularly evident in the borderlands of the Nasrid Emirate. In the frontier region between Alcalá la Real (conquered by Castile in 1341) and Moclin (conquered in 1486), the existence of a stable borderland remained devoid of settlement, and was instead marked by the presence of small towers. Here, written sources indicate the landscape was used for pasture. Even though isotopic studies of human diet in Guadalajara do not indicate any significant shifts between the Andalusi and Christian periods (albeit with methodological caveats, see Chapter 8), from the perspective of consumption, these were in one sense visibly opposing societies. Pig rearing contracted and then expanded again with the movement of the frontier across the Iberian Peninsula.

When combined with the evidence for settlement and land use transformation, it is evident that population movements associated with both Islamic and Christian territorial conquests were accompanied by changes in the use of the landscape. In broad terms, these are driven by Arab-Berber peasant groups in the Andalusi phase, and by centralised feudal authorities in the Christian phase, although the agents ‘on the ground’ were also peasants. This is clearly evident in the upper frontier of al-Andalus, where the frontier territory of Lleida saw the strategic development of fortified rural settlements, often including towers, near freshwater sources and with access to arable lands and pasture. Following the Aragonese conquest, the landscape was restructured as the Andalusi population was displaced or confined, and Christian settlers extended the area cultivated with vines and cereals, and other forms of livestock management were adopted (see Chapter 11). This is also visible in the case of Guadalajara, where pollen cores from the vicinity of Atienza indicate an initial phase of forest clearance at higher altitudes

from the early 8th through to early 10th centuries (Currás 2012). At lower altitudes, widespread cultivation of cereals increased from the end of the 10th century. But evidence for woodland recovery also points to pasture management.

The Christian conquests resulted in the displacement and ghettoisation of the Andalusi population, and the landscape was then populated by migrating groups from adjacent Christian territories. This was accompanied by agricultural intensification clearly visible in written sources, but also in extant pollen sequences which indicate increased anthropogenic activity following the 11th-century shifting of the frontier, with reductions in upland pine and lowland oak cover, and rising signals of cereal cultivation and pastoralism. The establishment of the town of Molina de Aragón in the mid-12th century prompted new provisioning demands, and coincided with the expansion of the irrigated area in the floodplain of the Gallo river. Soil micromorphology at Molina revealed deep-rooted irrigation systems, long-term manuring with domestic waste and multiple phases of soil formation, indicating not only continuity but enhancement of existing practices under the new regime (see Chapter 5). This can be connected with an intensification in cultivation, the demands of the taxation system introduced by the Christian authorities and the growth in population, both in the countryside and in the urban areas of the lordship. The intensification of cultivation also saw the construction or revitalisation of terrace systems. The longer-term environmental picture also points to the intensification of cultivation in central and eastern Iberia on either side of the mid-14th-century pandemic (Izdebski *et al.* 2022). In contrast, in the Nasrid-controlled Granada basin, highly fertile irrigated lowlands, such as those near Cartuja and Agicampe, were cultivated using terracing, soil recycling and, most likely, stubble burning. Torre de Agicampe is located in an area which today has unproductive to moderate soil capacity (unlike around the site by the Genil river) and, during the medieval period, soil erosion may have been the impetus for terrace construction adjacent to the site. Pollen records from the Sierra Nevada trace shifting arboreal cover and fire regimes across millennia, but show intensified olive and chestnut cultivation alongside increased charcoal deposition during the Nasrid period, pointing to sustained arboriculture and land clearance in upland settings despite climatic fluctuation. Following the Castilian conquest, transformations in land use were not immediate; at Aynadamar, for instance, the shift from Nasrid orchards to a Christian dryland farming regime took decades, with micromorphological evidence showing gradual soil reconfiguration and reuse of earlier garden soils (see Chapter 5).

Changes in extraction are also visibly associated with the shifting of the frontier. In Guadalajara, Lleida and Andalusia, the shift from Islamic to Christian control correlates with changes in material use. Andalusi construction techniques typically employed high-quality gypsum mortars

and durable lime tapials suited to regional conditions, whilst Christian fortifications used locally sourced sandy lime mortars. This also reflects shifts in the construction industry associated with population displacement, although it is important to nuance this with the evident presence of mudejar artisans working with high-status and religious buildings. In the Nasrid Emirate, there is some evidence for standardised construction techniques and materials, hinting at centralised planning. Following the Castilian conquests, the same sites were modified or rebuilt, often less durably, suggesting different administrative priorities and resource mobilisation strategies. The persistence of tapial construction also reflects the continuity of certain building traditions despite the political upheavals.

The Christian conquest and subsequent designation of Molina de Aragón as a frontier lordship saw the significant intensification of exploiting mineral resources. Mining and metallurgy, especially for iron, copper and silver, expanded in scale and sophistication and involved two new groups — Jewish smiths and Christian miners, as well as masons working with iron workers in building the walls of Molina's castle. The shift from Andalusi peasant-based mining to seigneurial-driven exploitation was marked by technological innovations, such as hydraulic forges along riverbanks and the institutional structuring of production through the use of charters and market regulation. Archaeological and archaeometric evidence from the Jewish quarter of Molina confirms intensive metallurgical activity and integration into long-distance networks, whilst the systematic exploitation of local mines such as Sierra Menera, Pardos, reflect a direct correlation between conquest, feudalisation and an intensification in resource exploitation.

The reorganisation of territory following the Albigensian Crusade was accompanied by the redistribution of natural assets, including access to woodland and mines. Pollen profiles from the eastern Pyrenees indicate that cultivation and deforestation increased from the 10th and 11th century and continued without a noticeable break until the 14th century, when regrowth of woodland can be associated with a phase of settlement abandonment (see Chapter 13). In some cases deforestation can be linked to charcoal burning to supply local metalworking industries. A case in point is evident from analysis of peat deposits at Vallsera, where the first major phase of deforestation is evident between the late 10th and mid-12th century. A second phase follows in the 13th century, after which woodland regeneration is evident after the archaeologically visible abandonment of the settlement. The regional trend also coincides with the onset of the Little Ice Age, and hydrological changes which include the displacement of the mouth of the Aude in 1316. This resulted in substantial floods that impacted settlements in the plain.

Zooarchaeological data reveal strong continuity in animal husbandry practices following the Albigensian Crusade (see Chapter 14). Across both feudal and royal phases, there is

sustained reliance on sheep and goats, followed by pigs and cattle. Pork consumption was a common feature of rural seigneurial consumption in the 10th–12th centuries. There were differences between urban and rural sites, with cattle being more prominent than caprines in the former. Sheep and goat continued to dominate into the later medieval period. Whilst the fragmentary data makes it difficult to identify any chronological changes in butchery practices or supply strategies, there are hints of intensification in exploitation patterns under royal rule — such as the diversification of species, age-at-slaughter profiles reflecting strategic herd management and increased butchery standardisation. Moreover, castles like Peyrepertuse and Saint-Pierre show signs of increased provisioning complexity in the royal period, including structured meat processing, systematic marrow extraction and evidence of imported or distributed marine resources (e.g. Mediterranean fish and sea bass). These patterns hint at a more integrated and possibly intensified supply network under the crown, linked to garrison provisioning and military logistics. However, in general, husbandry and hunting practices at each site remained stable on either side of the French annexation, suggesting that the Crusade had little effect on either pastoral or commercial activities across the frontier. In fact, it may have even boosted trans-Pyrenean relations. When inquisitors sought to cut off a 'Cathar route' that enabled herds to travel between the south of the Ariège and the pastures of the Agly, near Perpignan, this measure promoted further links with Catalonia, where herds were sent.

#### ***4. How resilient were frontier societies following conquests and the imposition of new regimes?***

Post-colonial theory offers a valuable framework for interrogating the power asymmetries, cultural negotiations and identity formations that characterised life in frontier societies. Rather than treating cultural change as a one-sided process of acculturation, this approach foregrounds the agency of subaltern communities navigating colonial and post-conquest regimes (Naum 2010). Archaeological evidence thus reveals not only processes of domination, but also the negotiated and often ambivalent forms of continuity that complicate narratives of cultural rupture. Cultural landscapes were shaped not only from above, but also from below, through the actions of peasants, artisans and minority communities. At different points in the frontier societies examined by the collective studies in this book, the agency of Muslim, Jewish and Christian communities in navigating, appropriating or resisting new societal norms has been highlighted at multiple scales, from the Andalusi community in Cartuja, the Jewish community in Molina and the Occitan community in Montailou, to the broader settlement patterns created by Muslim and Christian peasants.

The Christian conquests of Andalusi territories initiated a gradual but decisive restructuring of the rural and urban

landscape, marked by the shift from dispersed, often agriculturally integrated *alquerías* to more nucleated Christian villages, frequently located in proximity to castles, churches or seigneurial estates. Pollen and sediment evidence suggest continuity in landscape management, including the ongoing use of pasture and woodland mosaics, especially in transitional areas like Cañamares and Atienza, where medieval agroforestry systems persisted well into the early modern period (see Chapter 5). However, in regions which saw the displacement of the indigenous population, this reflects the agency of the incoming Christian (and Jewish) settlers. These settlers colonising Andalusi territories after conquest demonstrated a form of colonial resilience, visible in their ability to adapt to inherited landscapes, climatic variability and unfamiliar agricultural regimes. In sites like Molina de Aragón, Christian authorities regulated existing irrigation systems of Andalusi origin, adapting them to feudal legal frameworks while maintaining productivity through soil enrichment and terrace cultivation. The micromorphological evidence for long-term manuring and soil reuse reflects both continuity and transformation, as settler communities modified earlier systems to meet new socio-economic demands. This settler resilience also entailed the cultural adaptation of agrarian technologies.

In southern Iberia, Christian colonists reused Nasrid infrastructure, integrated local building materials and practices, and exploited new resources such as salt, metals and woodland for fuel and construction. In more marginal zones such as Agicampe, where soil quality was poor, terraces were repurposed or rebuilt by post-conquest settlers to retain fertility and manage water, a process reflecting environmental learning and resilience under stress. Similarly, in Aynadamar, the replacement of Nasrid orchard agriculture with dryland farming systems reveals a delayed but deliberate transformation of land use strategies adapted to new market and administrative logics. Other cases are also known, such as that of Casarabonela, where after the Christian conquest irrigation continued to be practiced 'as it was done in the time of the Moors' (as stated in contemporary documents), albeit with certain expansions and adaptations to ensure that water also served new social and economic needs, such as mills or small farmsteads. This process was not without conflict and ultimately culminated in the expulsion of the Moriscos in the 17th century (Retamero and Martínez-Enamorado 2018).

At the landscape scale, this resilience reflects the capacity of frontier settlers to create viable economies under shifting political conditions, even as they attempted to impose new social and religious norms. While their arrival marked disruption for existing populations, the settlers themselves faced challenges of unfamiliar environments, limited institutional support and the necessity of integrating with or managing the material legacies of the societies they replaced. As such, ecological resilience in medieval Iberia

can be understood as a multi-directional and multi-ethnic process. Even as the movement of frontiers transformed landscapes, elements of earlier land use, infrastructure and spatial memory endured, testifying to the layered and negotiated nature of social change.

Following the Arab-Berber conquest of Iberia, cultural resilience is most evident with the persistence of Christian (Mozarab) populations, which are archaeologically visible predominantly from their cemeteries. With the Christian conquests of al-Andalus, there are more varied material indicators of cultural resilience from the indigenous population despite the displacements in the upper parts of the frontier, and the religious and legal pressures on the population in the Nasrid Emirate. In Atienza, the construction of the church of Santa María del Rey in the 12th century included the addition of a bilingual inscription in Latin and Arabic on its portal, dating to the reign of King Alfonso VIII (mid-12th to early 13th century). Who carved this? Most likely Andalusi sculptors, and here there is evidence for continuity in the adjacent Muslim settlement from the Caliphal period through to the 12th century. Throughout the Guadalajara region, the presence of 12th- and 13th-century Mudejar architecture (as at San Petro, Villacadima; Santa Coloma, Albendiego; San Simón, Brihuega; Santuario de Nuestra Señora de la Antigua, and the later Concatedral de Guadalajara) points to the existence of Andalusi workshops or masonry traditions (Fig. 15.8). However, as argued above, this does not appear to have been the case with construction crews. Mortar analysis showed a shift in ingredients across the Guadalajara region in the use of mortars, as well as building techniques, suggesting a wholesale replacement of masons and architects. It is also striking that Mudejar architecture is focused on churches and monasteries. The limits of resilience are marked by the abandonment of the Mudejar community around Santa Maria del Rey, later echoed in the abandonments of the Jewish quarters in both Atienza and Molina (and indeed, elsewhere in Iberia). Written sources indicate these communities did not completely vanish (e.g. in Molina; Montes 2009), but in these particular centres they become archaeologically invisible.

In the Nasrid Emirate, the best case study of resilience is provided by the persistence of the Andalusi community in Cartuja. The construction of a Carthusian monastery saw the transformation of the surrounding landscape, including changes in property structures, different agrarian regimes and the demolition of pre-existing structures. Here the discovery of ceramics and bones in a rubbish dump reflected Andalusi dining practices, which involved a group of people sharing food from large bowls called *ataifores*. The presence of these bowls rapidly decreased in Granada in the early 16th century, when they were replaced by smaller vessels reflecting the more individualistic approach to dining preferred by Catholic households. The combination of bowls and sheep bones, as well as the complete absence of pig pointed to a





Fig. 15.8. The Romanesque church of San Pedro Apóstol in Villacadima, with its distinct Mudejar architecture

Morisco household, albeit procuring meat from a centralised market, a creation of the new regime. The Catholic regime disapproved of these communal dining practices, which were clearly associated with Andalusí Muslim identity, and eventually banned them. The consumption of pork became the most prominent symbol of how the Inquisition monitored and enforced dietary practices. While its earlier efforts targeted individuals suspected of being crypto-Jews, by the latter half of the 16th century, the Inquisition increasingly focused on those Moriscos suspected of secretly maintaining Islamic practices, such as abstaining from pork. Since they were legally defined as Catholics, those who continued to follow Islamic traditions were labelled heretics. Moreover, in a context where religious conformity was equated with political loyalty, such individuals were also viewed as threats to the state. The imposition of Christian civic norms had a more profound impact on urban centres such as Murcia and Granada, where formerly integrated Andalusí populations were either marginalised or reconfigured.

In the eastern Pyrenees, the data reveals a high degree of homogeneity in eating habits, not only between sites, but also between different periods, reflecting a significant degree of resilience on the part of farmers, but also consumers and the commercial network. The most important animal group for consumers were caprines (especially sheep). Their economic importance varied from site to site (subsistence economy, wool industry, animal trade), which impacted the quality of the meat consumed. Cattle, on the other hand, were almost always reared for their meat and had to be purchased occasionally. In general, the results do not fit in well with what we find for elite sites, whether in the feudal or royal period (few young individuals, very low proportions of hunted species). The general trend of declining use of pigs' hind legs (and therefore ham) during the royal period nevertheless seems to mark a distinction between the *Faïdit* nobles and the royal garrisons. In Saint-Pierre, it seems that the commercial networks for the supply of caprine meat, developed by the local lords, were preserved during the royal

period. It also appears that this trade linked the region to the other side of the Pyrenees' border. By cross-referencing zooarchaeological data with the work of historians, it has become clear that this border was completely permeable to people, herds and goods. Despite political shifts, material culture (e.g. Catalan ceramics, trade goods) and animal provisioning routes remained connected across borders, suggesting the frontier was porous in practice. Most of the sites studied had close links with the trans-Pyrenean lands. These long-standing links were even strengthened following the Crusade, contributing to the homogenisation of patterns observed in meat consumption.

### Conclusion and directions for future research

This book has presented a comparative study of both frontier 'zones' and 'societies' in medieval Iberia and Occitania (Berend 1999), foregrounding how shifting political, military and cultural boundaries shaped settlement patterns, environmental exploitation and everyday lifeways impacted by conquest, regime change and population movements. By integrating a diverse suite of archaeological, historical, bioarchaeological and environmental data, it has demonstrated that frontier zones functioned not as peripheral or unstable regions, but as resilient and dynamic landscapes, structured by overlapping processes of colonisation, state formation and cultural negotiation. Our findings demonstrate that both Muslim-Christian and Christian-Christian frontiers were places of complex interaction, where centralising authorities imposed new administrative and religious regimes, but where local populations persisted (even where the majority were displaced), adapted and, in some cases, maintained cultural continuity through material practices. The case studies demonstrate distinct but interconnected frontier trajectories.

The Christian conquests in Iberia resulted in the progressive fragmentation and eventual dismantling of Andalusi political control, culminating in the annexation of the Nasrid Emirate of Granada by 1492. The process extended beyond the Iberian conquest itself, with colonising practices, the establishment of frontier spaces and transformations of the landscape that have their precedents in al-Andalus but ultimately culminate on the other side of the Atlantic, shaping modernity (Retamero and Torró 2018). In the peninsular side, like the French annexation of Occitania, this process was accompanied by the imposition of centralised feudal regimes, characterised by the redistribution of land to ecclesiastical authorities, military orders and migrant settler elites, as well as the introduction of new administrative and ecclesiastical infrastructures. The new sociopolitical order was expressed architecturally through castles, monastic foundations and town walls, and environmentally through intensified agricultural production geared toward producing a surplus and taxation.

There were regional differences. In the Guadalajara and Lleida regions, the conquests triggered fundamental transformations in settlement and land use: existing Andalusi rural landscapes were often entirely replaced by a network of Christian villages and new towns, while Muslim populations – if not displaced – were segregated into *morerías* or gradually assimilated under increasing cultural and religious pressure. The environmental footprint of these changes is visible in the intensification of agriculture and resource extraction, including mining and irrigation, and the reorganisation of territories to meet fiscal demands. Pig rearing and viticulture became a striking feature of the reshaped cultural landscapes. However, not all aspects of Andalusi lifeways vanished, and continuity is evident in the reuse and expansion of irrigation systems and the gradual integration of Andalusi architectural forms in elite and ecclesiastical architecture, mediated through Mudejar artisans. By contrast, in the southern frontier zone of the Nasrid Emirate, particularly along the north-western border of Granada, the 13th to 15th centuries saw a more protracted, militarised phase of territorial encroachment. Here, a dense network of fortifications on both sides of the frontier marked the contested boundary, while Castilian advances were accompanied by the creation of new towns, and the reinforcement of state authority through the military orders and seigniorial investment. Although some Andalusi rural communities remained in place as Mudejars, with the final Castilian conquest their cultural autonomy gradually eroded under legal and religious pressure, culminating in the forced conversions and expulsions of the Moriscos. Nevertheless, material culture and zooarchaeological evidence from sites such as Cartuja show that dietary practices and communal dining traditions persisted long after the formal conquest.

The Albigensian Crusade was followed by the annexation of Occitan territories and the defining of a new borderland between French and Aragonese territory. Like the Norman Conquest of England, this was accompanied by the introduction of a centralised administration, and the redistribution of confiscated estates amongst a small, migrant elite group and their descendants. This was accompanied by investment in fortifications, religious institutions and planned towns, contributing to the region's economic boom despite the ravages of the war. The clearest definition of the frontier in the eastern Pyrenees is expressed in the political landscape defined by castles, rather than the general settlement pattern. The local population remained largely intact. Religious policing on the French side of the border had an extensive reach, as exemplified by Montailhou, and represented the most visible long-term cultural trauma of the Crusade. However, despite some examples of abandonment in the 13th century, demographic decline in the eastern Pyrenees is only evident in the second half of the 14th century, and can be attributed to multiple, interconnected factors, with migration to towns playing a significant role. The Little Ice



Age which brought cooler, wetter conditions contributed to episodes of flooding in the plains, but also made marginal farming less viable in upland valleys. With the abandonment of upland settlements, areas of woodland regenerated. Despite the political divisions created in the mid-13th century, cross-border networks of transhumance and trade continued, highlighting the porosity of the frontier in practice.

These responses complicate traditional narratives of rupture and allow us to see conquest as a prolonged and uneven negotiation of cultural and ecological identities. Crucially, these dynamics are framed within the concept of resilience, understood not only ecologically but also socio-culturally. Resilience in frontier societies was expressed through both adaptation and continuity: through the persistence of agricultural techniques, livestock strategies, and communal dining practices, but also in the reorganisation of space, labour, and material culture in ways that maintained ethno-religious identity. By distinguishing between zones of interaction and the layered formation of frontier societies, the studies in this volume have shown how conquest did not result in uniform replacement but in varied, context-specific patterns of continuity, disruption and adaptation. Religious identity, institutional capacity and environmental opportunity all played roles in shaping these trajectories. By disaggregating frontier change into its military, socio-economic, cultural and administrative phases, and attending to regional variability, these studies have further complicated monolithic interpretations of the Iberian conquests and French expansionism.

This book also provides a methodological model for integrated frontier studies, drawing on a diverse range of perspectives, and we have demonstrated the benefits of a granular approach towards individual categories of data. The value of interdisciplinarity has also been highlighted, both between and within fields, for example in the case of the study of plant macrofossils pushing the state of the art would necessitate the integration of carpological, isotopic, autecological and quantitative eco-anatomical analyses. Geometric morphometrics also provides a powerful tool for exploring intraspecific diversity, particularly for comparative studies of different areas within the same polities. Similarly for the study of animal husbandry and diet, the incorporation of additional stable isotopes, such as sulphur, strontium and oxygen will facilitate a more comprehensive exploration of animal mobility and broader dietary patterns in different regions. The systematic integration of new isotopic datasets with growing zooarchaeological and archaeobotanical datasets will provide an even more nuanced and holistic understanding of subsistence strategies and human-animal interactions across time and space. Reconstructing vegetation change has proven to be challenging, largely due to the lack of suitable and unaltered depositional basins in close proximity to medieval settlements. The majority of existing pollen studies have focused on

lakes in marginal environments, often at high altitude. In terms of archaeological approaches, knowledge of medieval rural settlement remains limited as traditional foci of research have been fortified and urban sites. Fieldwalking and small-scale excavations have contributed to a broad chronology of occupation, enabling broader settlement patterns to be reconstructed. However, the biographies of individual settlements remain to be explored in more detail. The rich medieval architectural heritage of Spain, Portugal and southern France, as well as the substantial corpus of excavated metal artefacts, also both offer further opportunities for exploring cultural transformations through the lens of technological change. In the case of metal objects which are routinely found on all categories of medieval period sites, an integrated approach drawing on a range of isotopic and compositional analyses alongside metallography and experimental archaeology would represent the state of the art for future studies.

In conclusion, this book provides a template for future interdisciplinary research into frontiers and has identified critical gaps in the archaeological record, particularly relating to rural settlements and environmental archives. It has outlined a roadmap for future research that will deepen our understanding of historical resilience in frontier contexts. These insights have the potential to inform wider comparative and theoretical models in medieval studies, and more broadly within environmental archaeology and archaeologies of conflict.

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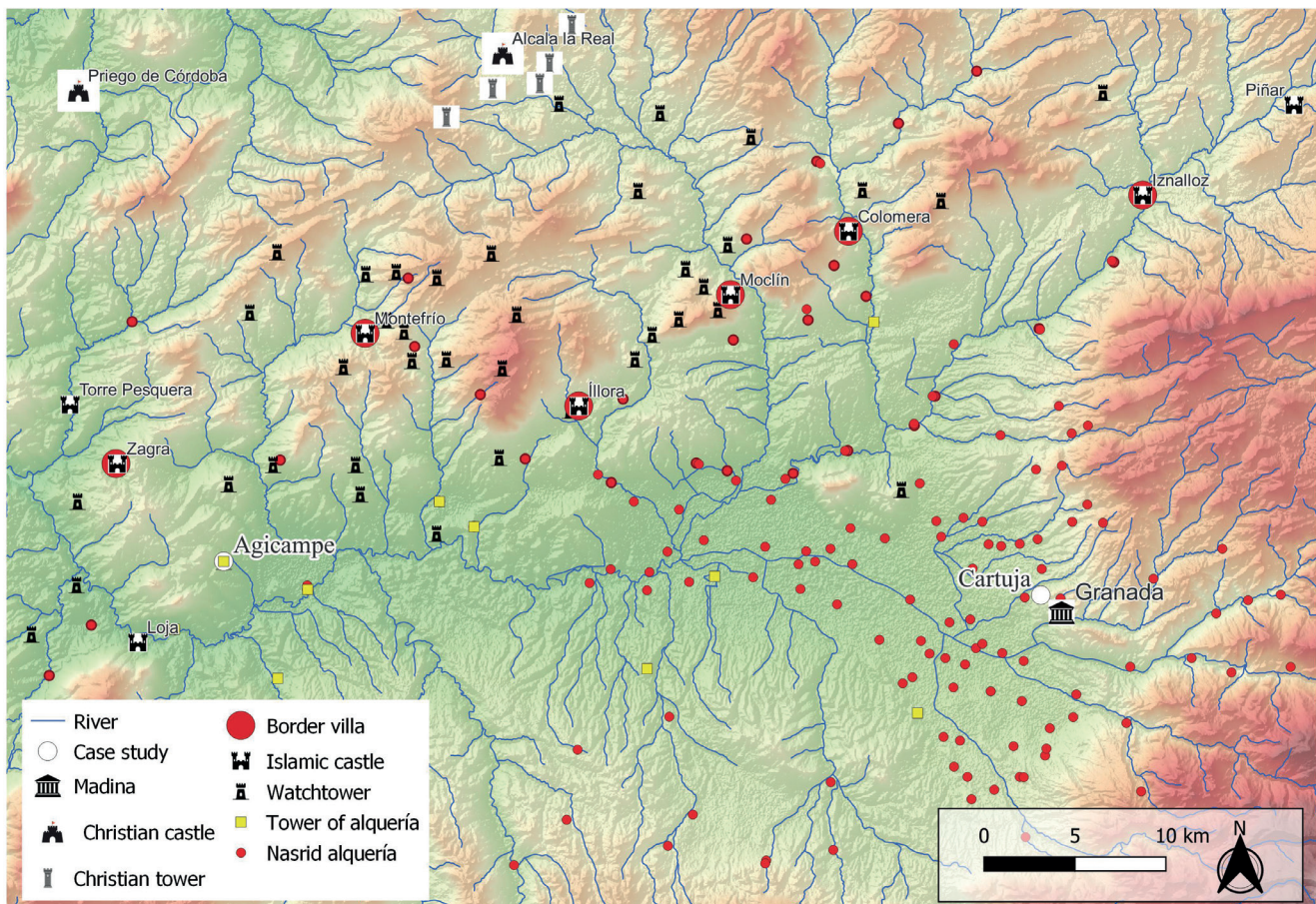


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*Plate 3.1. Aerial view of Atienza with the castle in the background*



*Plate 4.1. Map showing Andalusí settlement in the north-western Nasrid-Castilian frontier*



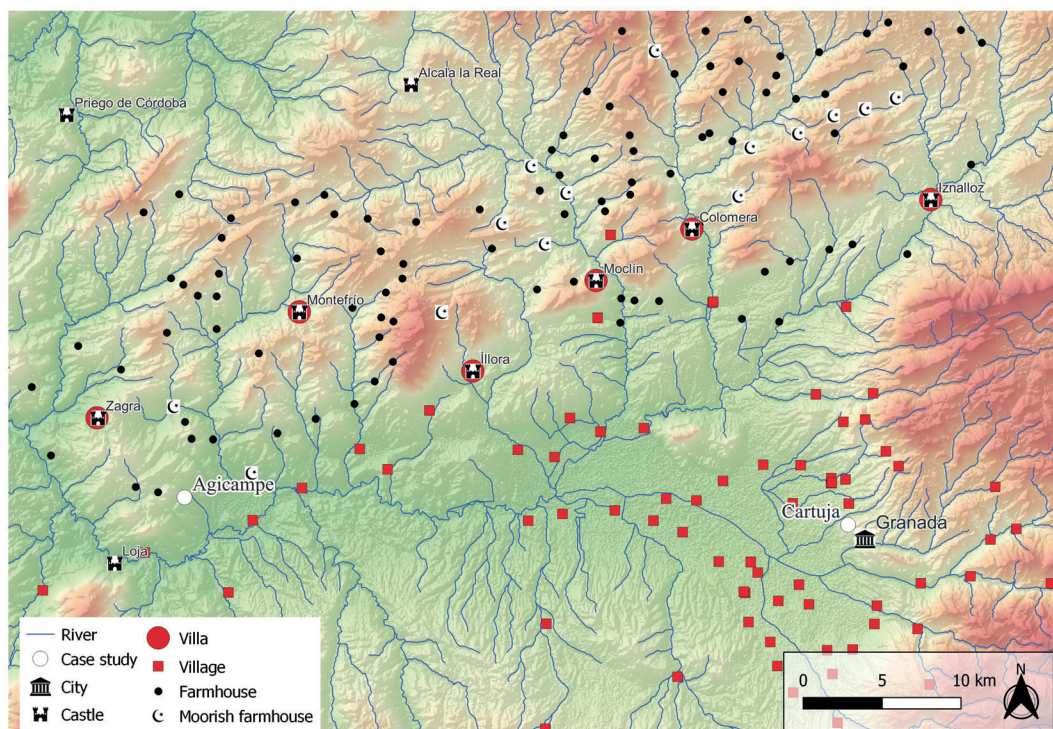


Plate 4.2. Map showing settlement in the territory of Granada after the Castilian conquest

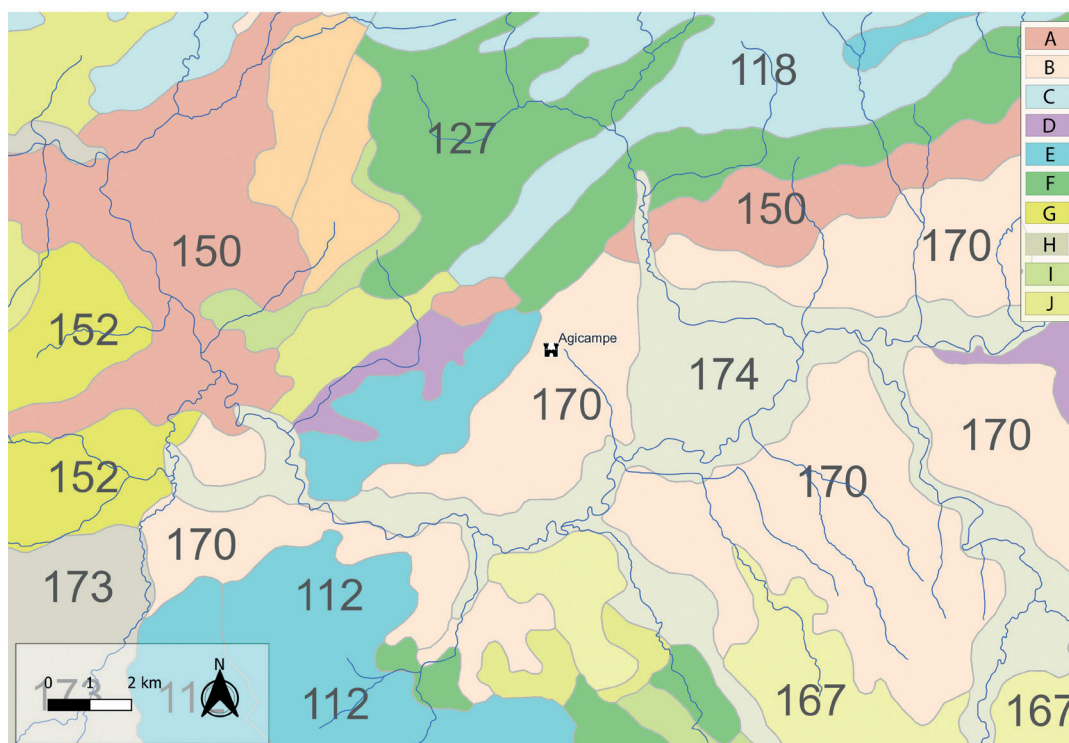


Plate 5.1. Geological map of the territory around the Agicampe site. A: Resedimented blocks and pebbles, shales, red clays, gypsum and marls; B: Conglomerates, sandstones, red clays, marls, limestones and carbonates; C: Limestone, marly limestone, margolimestone, detrital limestone; D: Red and green shales with gypsum and sandstone intercalations; E: Carniolas, dolomitic breccia, dolomites and limestones; F: Limestone, orbotoline limestone, marly limestone, marl and sandstone; G: White marls, limestones, biocalcarenes and breccia; H: Conglomerates, gravels, sands, shales, marls, calcarenites, travertine limestones and tuffs; I: Alternation of sheeted limestone, marly limestone, marl and white and red marl limestone; J: Conglomerates, sandstones, clays, limestones and gypsum



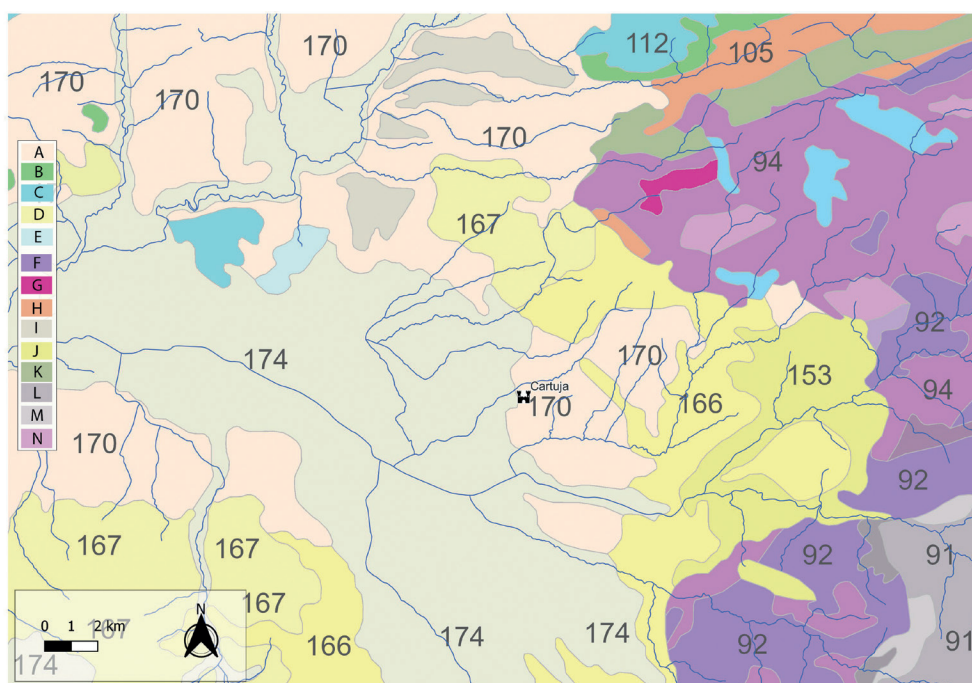


Plate 5.2. Geological map of the territory around the Cartuja site. A: Conglomerates, sandstones, red clays, marls, limestones and carbonate; B: Limestone, orboline limestone, marly limestone, marl, sandstone and shale; C: Carniolas, dolomitic breccia, dolomites and limestones; D: Conglomerates, sandstones, clays, limestones and gypsum; E: Limestone, marly limestone, margolimestone, detrital limestone and radiolarian marl, sometimes volcanic rocks; F: Carbonate rocks; G: Carbonate rocks; H: Limestone, marl, sandstone and clay; I: Conglomerates, sandstones, gravels; J: White marls, biocalcarenes and limestones; K: Sandstones, silts, red conglomerates and carbonate rocks; L: Dark shales; M: Light shales; N: Dark schists, gneisses, micaschists, amphibolites, grey schists, quartzites and marbles

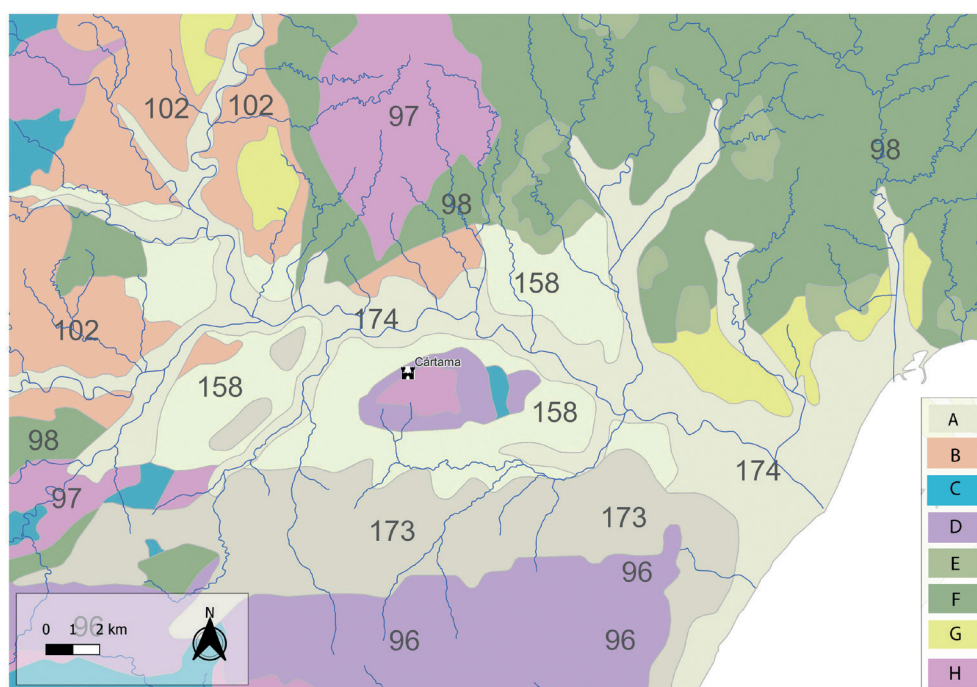


Plate 5.3. Geological map of the territory around the Cártama site. A: Carbones, sandstones, gravels, sands, silts and clays; B: Clays, sandstones and marls; C: Peridotites; D: Marbles; E: Sandstones, silts, red conglomerates and carbonate rocks; F: Phyllites, metapelites, shales, sandstones, greywackes; G: White marls, biocalcarenes and limestones; H: Dark schists, gneisses, micaschists, amphibolites, grey schists, quartzites and marbles

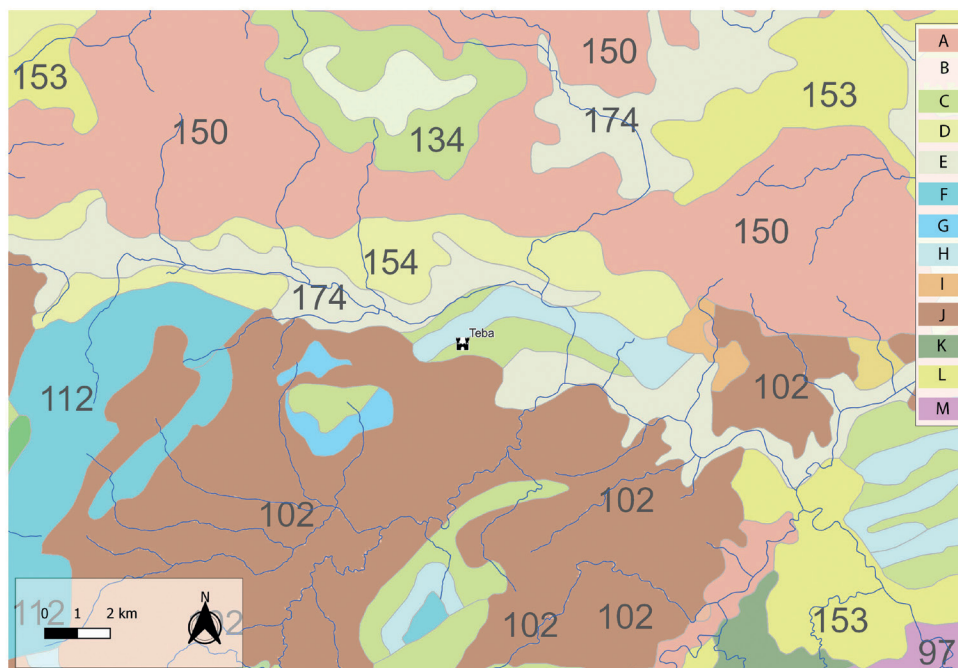


Plate 5.4. Geological map of the territory around the Teba site. A: Resedimented blocks and pebbles, shales, red clays, gypsum and marls; B: Shales, marls, calcarenites, sands and conglomerates; C: Alternation of table limestones, marly limestones, marls and white and red marl; D: Marls, biocalcarenes and reef limestones; E: Conglomerates, sandstones, gravels, sands, silts and clays; F: Carniolas, dolomitic breccia, dolomites and limestones; G: Massive dolomites, limestones, dolomites and marls; H: Limestone, marly limestone, detrital limestone and marl with radiolaria and basic volcanic; I: Marls, sandstones and clay; J: Clay, sandstones and marls; K: Phyllites, metapelites, shales, sandstones, greywackes and limestones; L: White marls, biocalcarenes and limestones; M: Dark schists, gneisses, micaschists, amphibolites, grey schists, quartzites and marbles

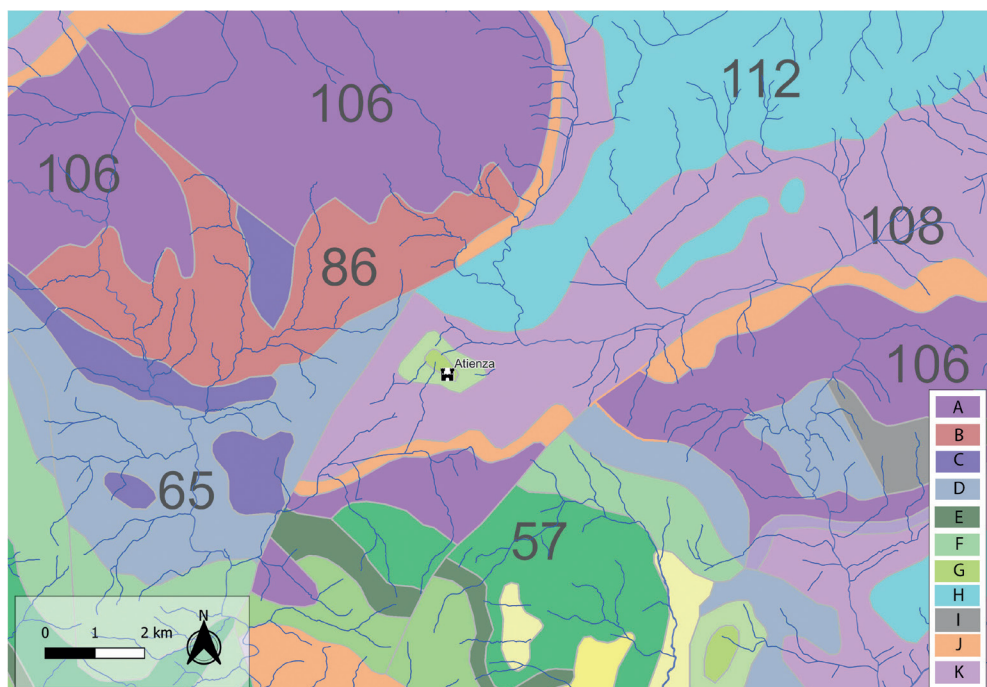


Plate 5.5. Geological map of the territory around the Atienza site. A: Conglomerates, sandstones and red clays; B: Sandstones, shales, conglomerates, vulcanites and limestones; C: Volcanic rocks. Andestites, basalts, dacites and rhyolites; D: Black schists, lydites, quartzites and limestones; E: 'Armoricana Quartzite' Quartzites; F: Slates, sandstones, quartzites, limestones and conglomerates; G: Well-stratified limestones, marls, and massive-looking dolomites; H: Carniolas, dolomitic breccia, dolomites and limestones; I: Slates, greywackes and limestones; J: Dolomites, limestones and marls; K: Red and green shales with gypsum, sometimes with sandstone



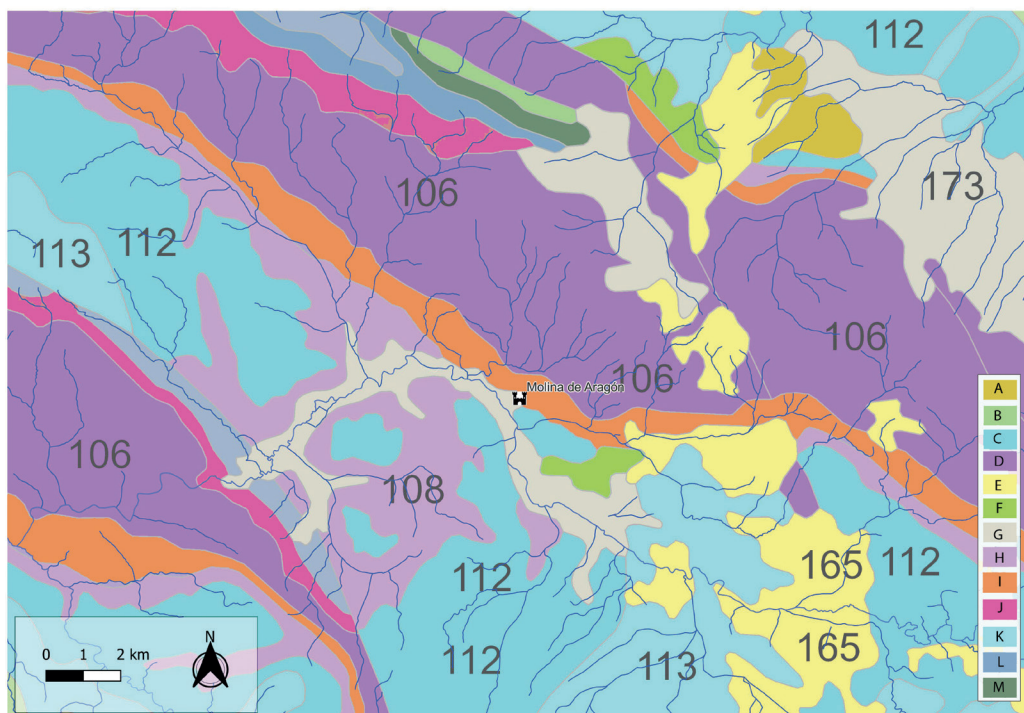


Plate 5.6. Geological map of the territory around the Molina de Aragón site. A: Conglomerates, sandstones, shales, limestones, marls and gypsum; B: Quartzites and slates; C: Carniolas, dolomitic breccia, dolomites and limestones; D: Conglomerates, sandstones and red clays; E: Conglomerates, sandstones, shales, limestones, marls and gypsum; F: Dolomites, limestones, calcarenites, massive dolomitic breccia, calcareous sandstones, marls and ioclastic limestones; G: Conglomerates, gravels, sands, shales, marls, calcarenites, travertine limestones and tuffs; H: Red and green shales with gypsum, sometimes with sandstone intercalations; I: Dolomites, limestones and marls; J: Sandstones, shales, conglomerates, vulcanites and limestones; K: Marly limestones, table limestones, bioclastic limestones, marls, marl limestones and sandstones; L: Sandstones, conglomerates, slates and coal beds; M: Quartzites

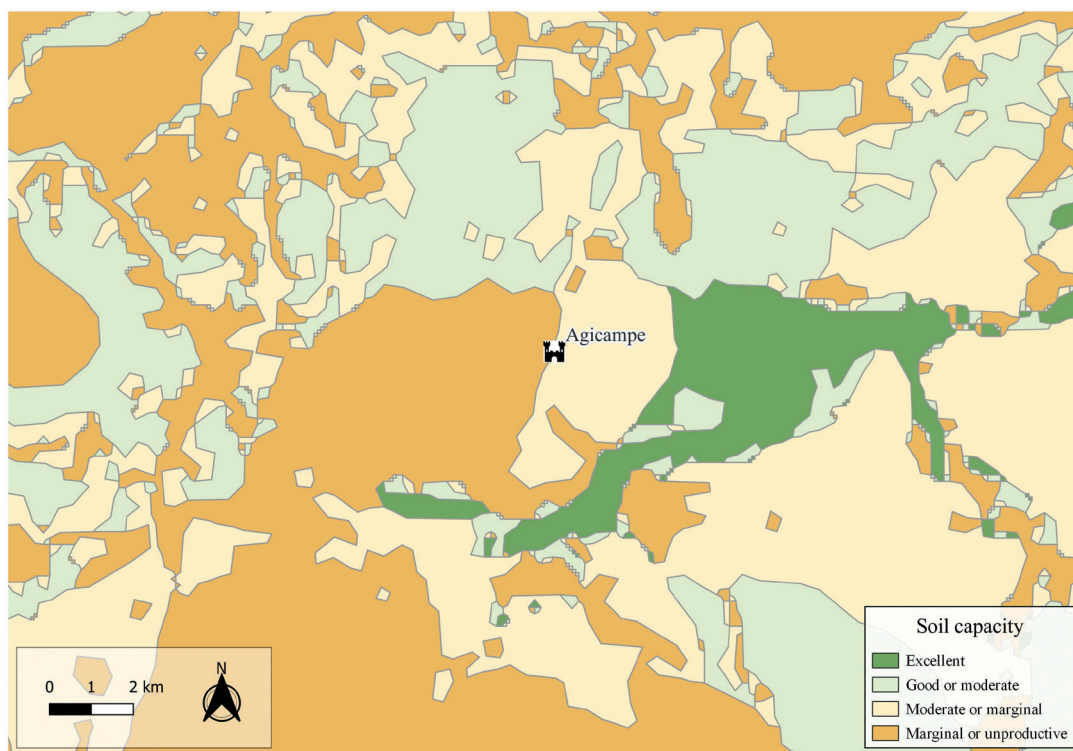


Plate 5.7. Quality map of land use capacity in the Agicampe area



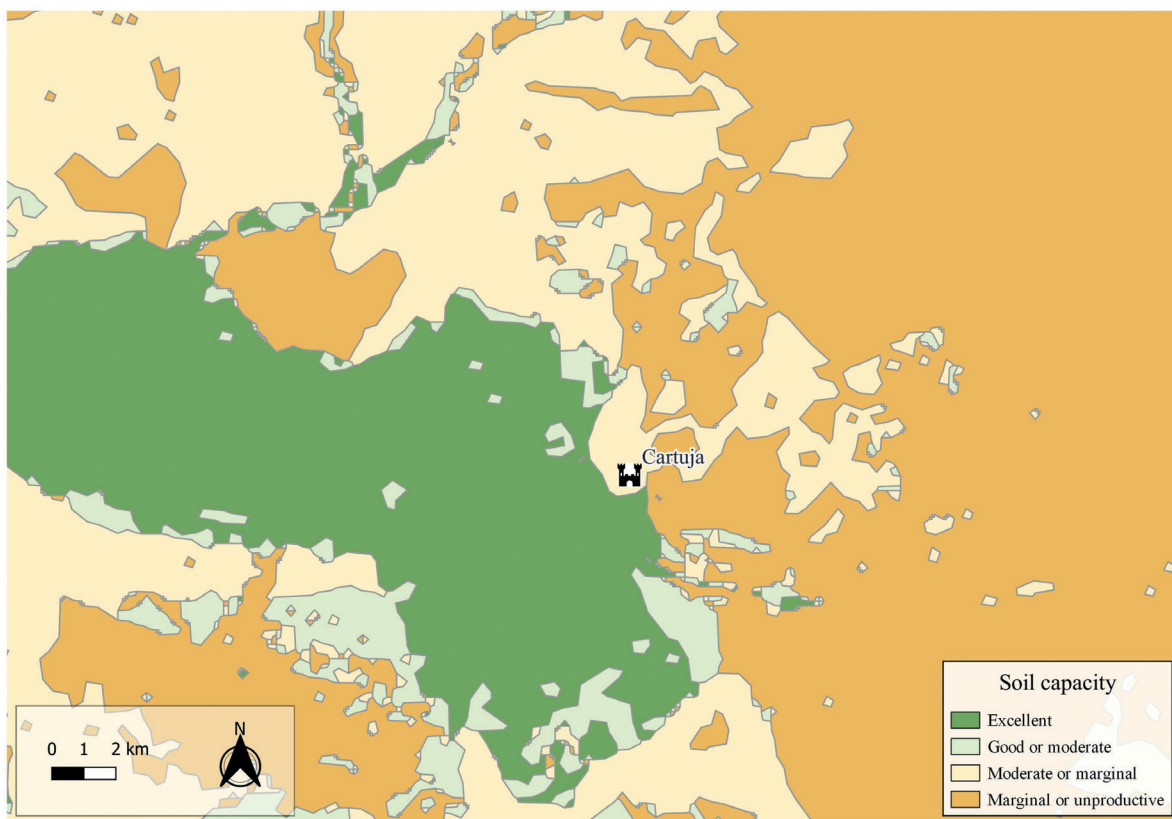


Plate 5.8. Quality map of land use capacity in the Cartuja area

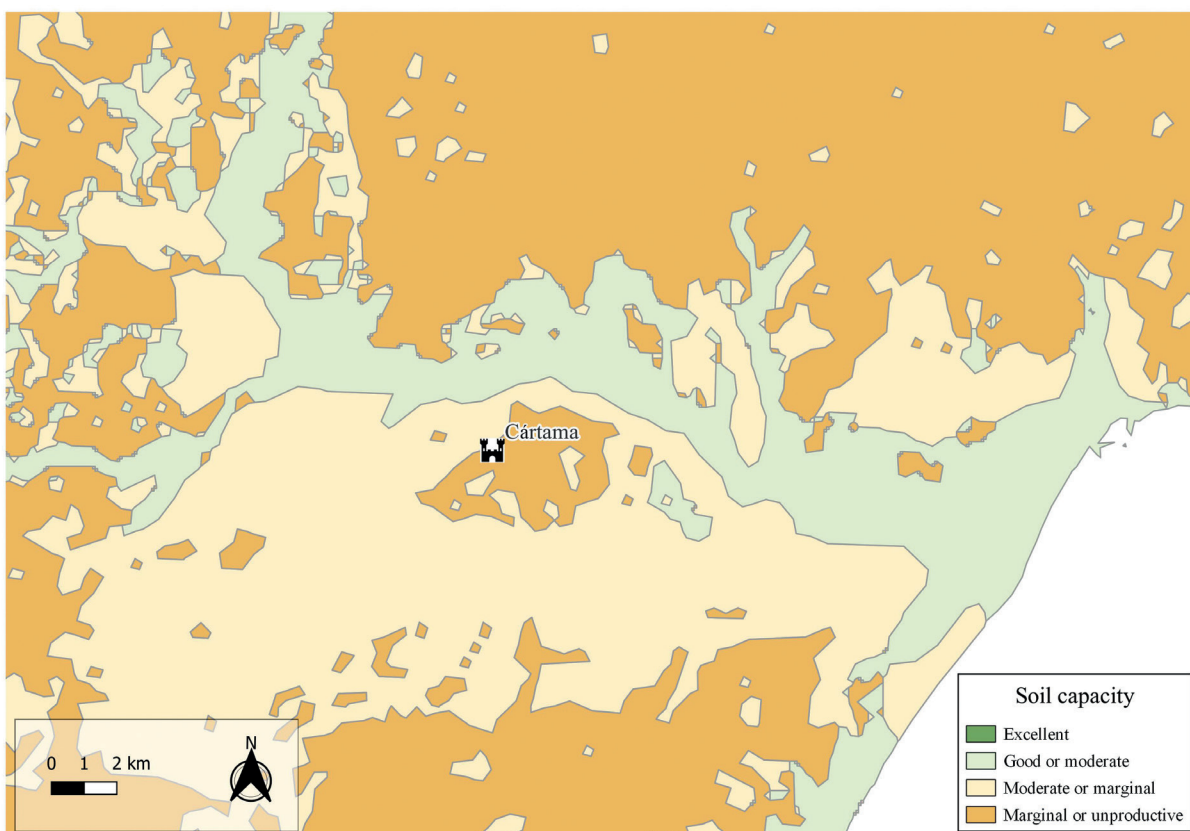


Plate 5.9. Quality map of land use capacity in the Cártama area

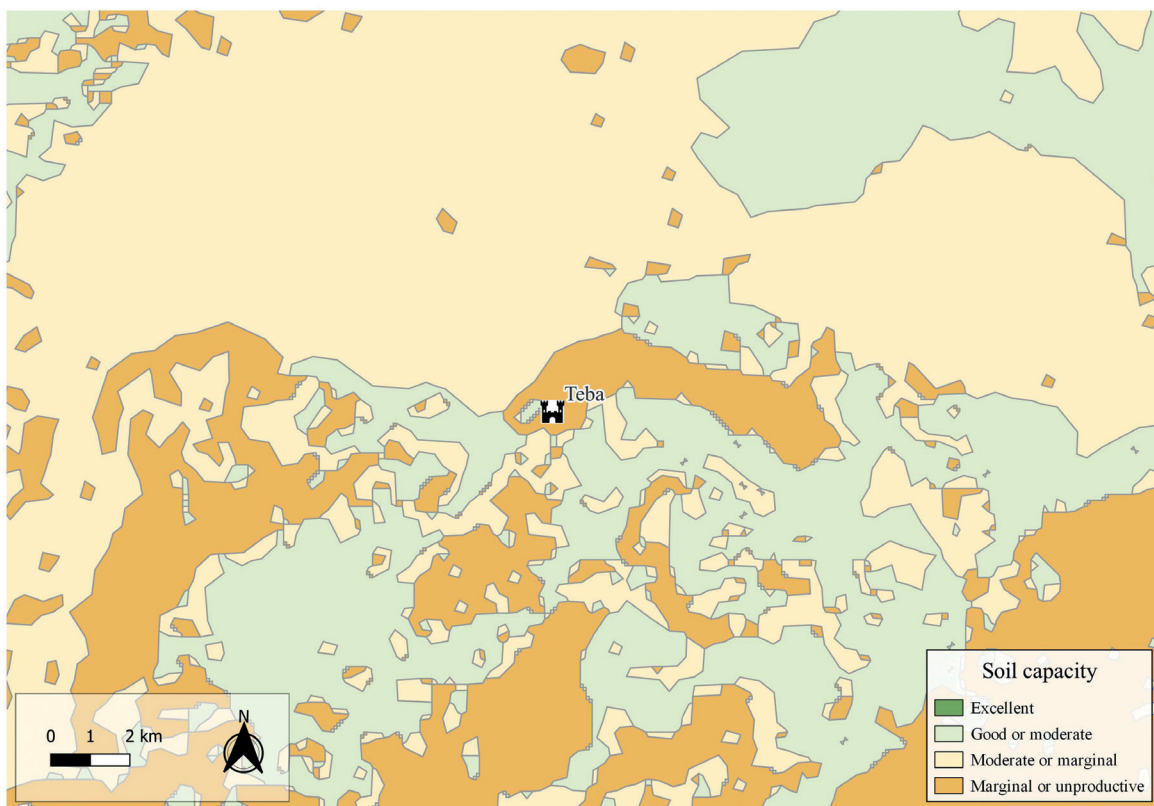


Plate 5.10. Quality map of land use capacity in the Teba area

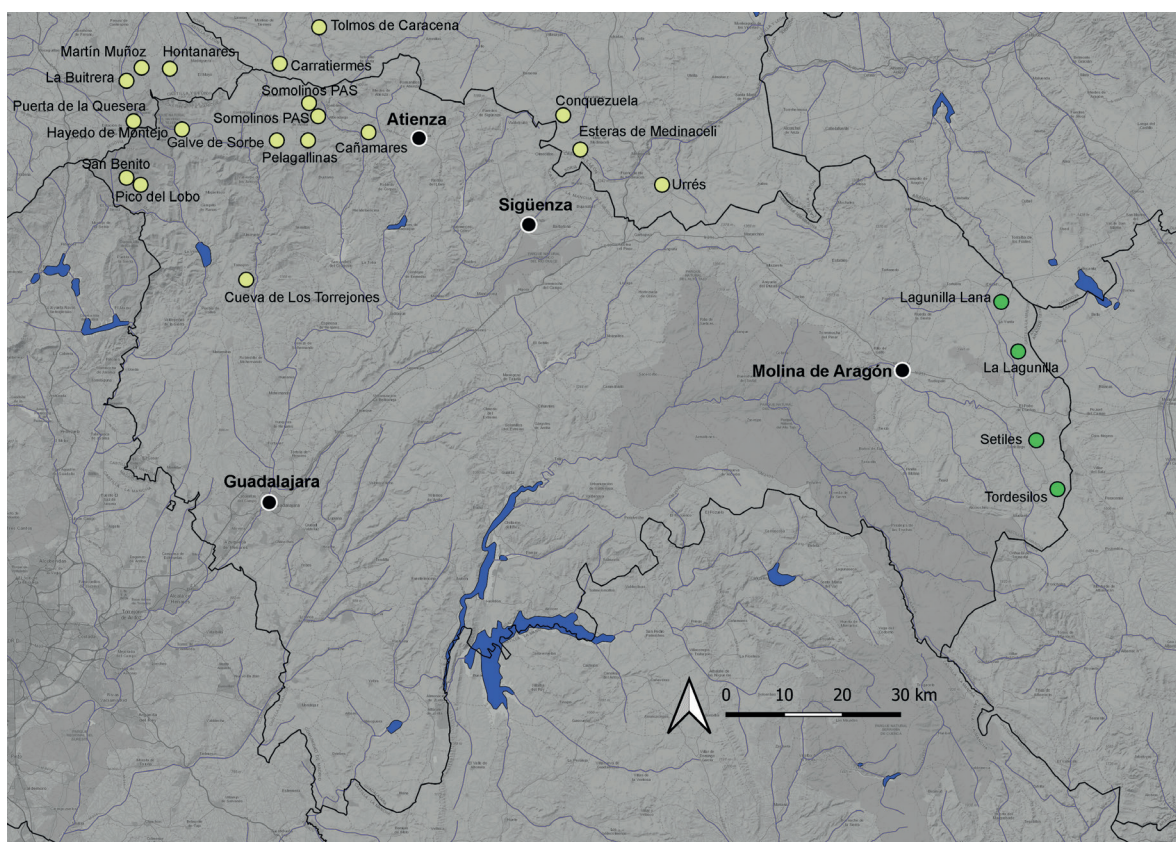


Plate 5.11. Map showing the locations of coring in the Landscapes of (Re)Conquest project (green) and previous pollen studies (yellow) within and around the province of Guadalajara



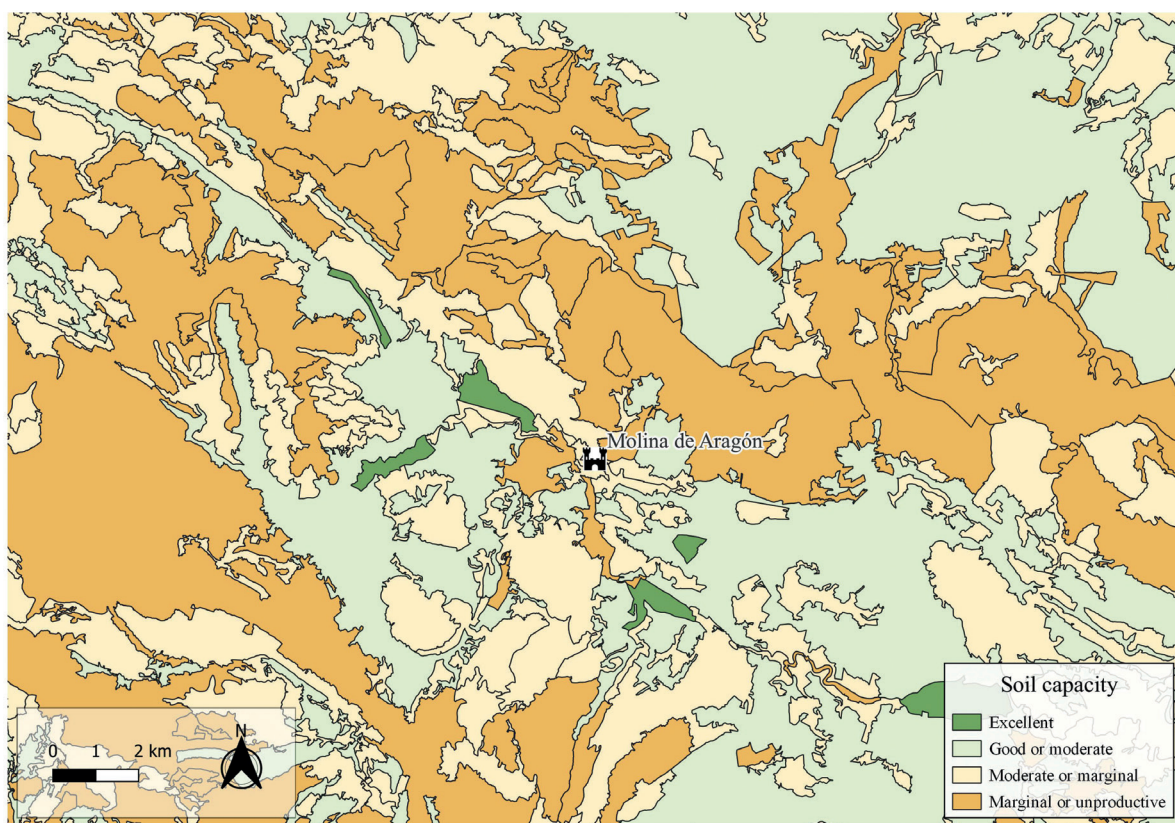


Plate 5.12. Quality map of land use capacity in the Molina de Aragón area

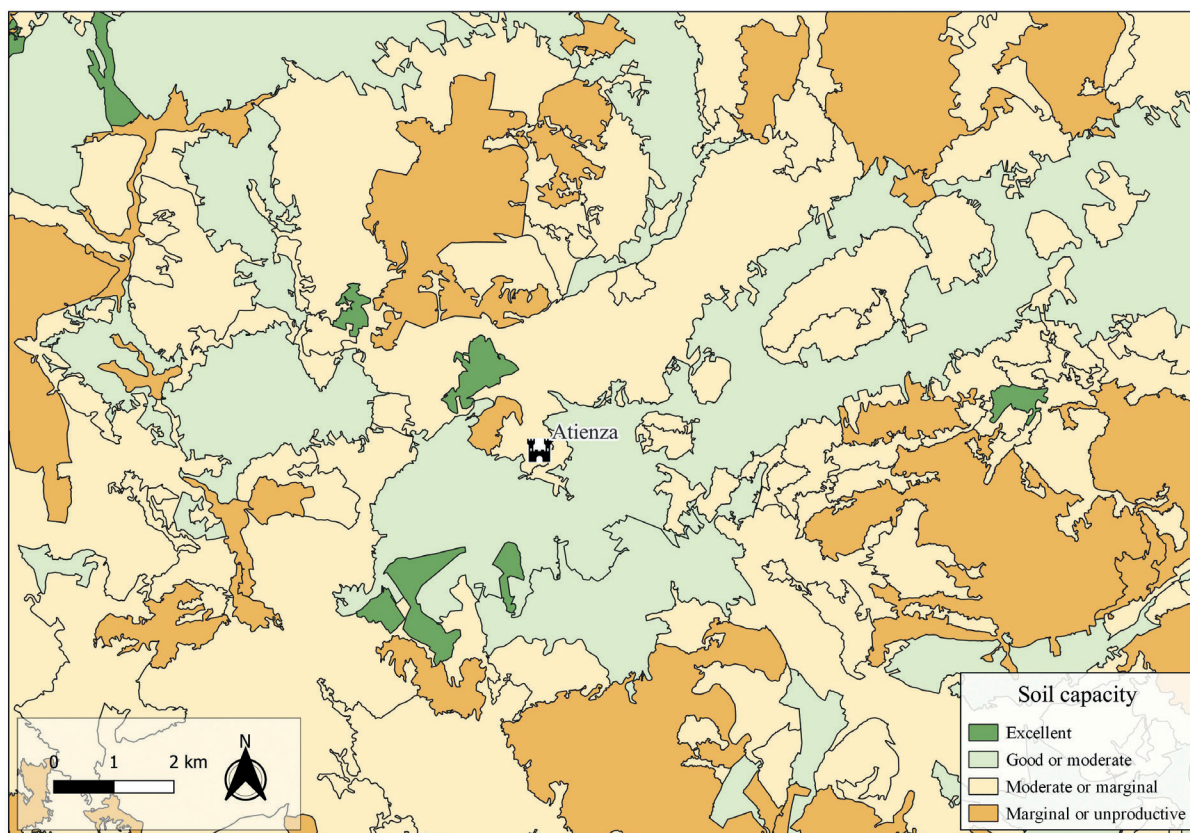


Plate 5.13. Quality map of land use capacity in the Atienza area



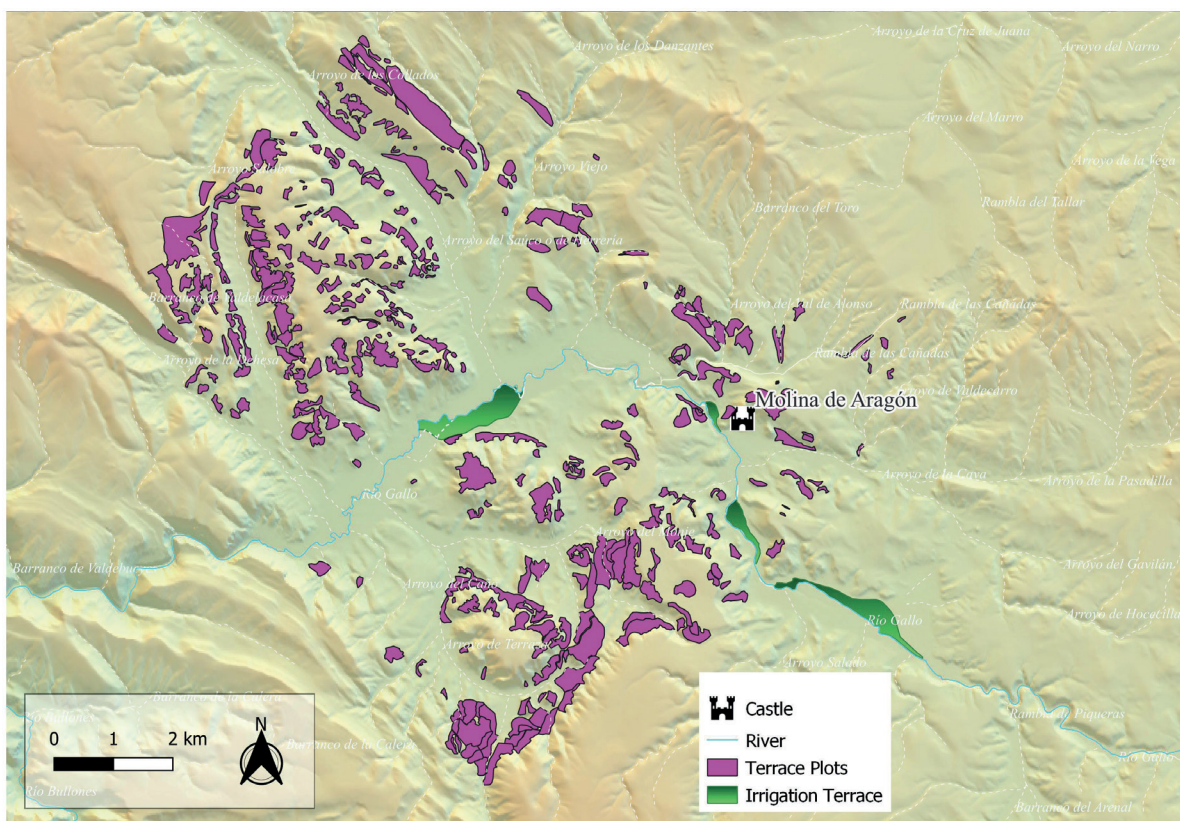


Plate 5.14. Terraced plot and cultivation irrigation terraces around Molina de Aragón

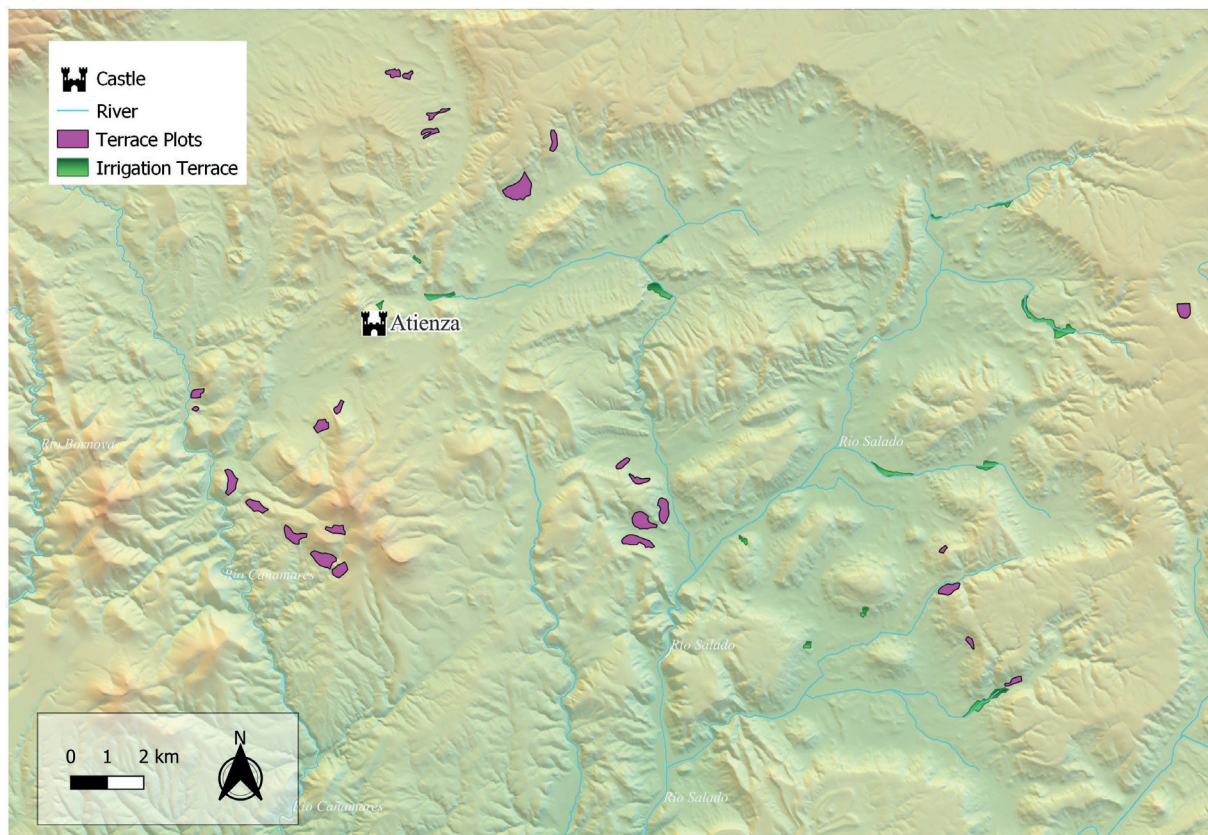


Plate 5.15. Terraced plot and cultivation irrigation terraces around Atienza



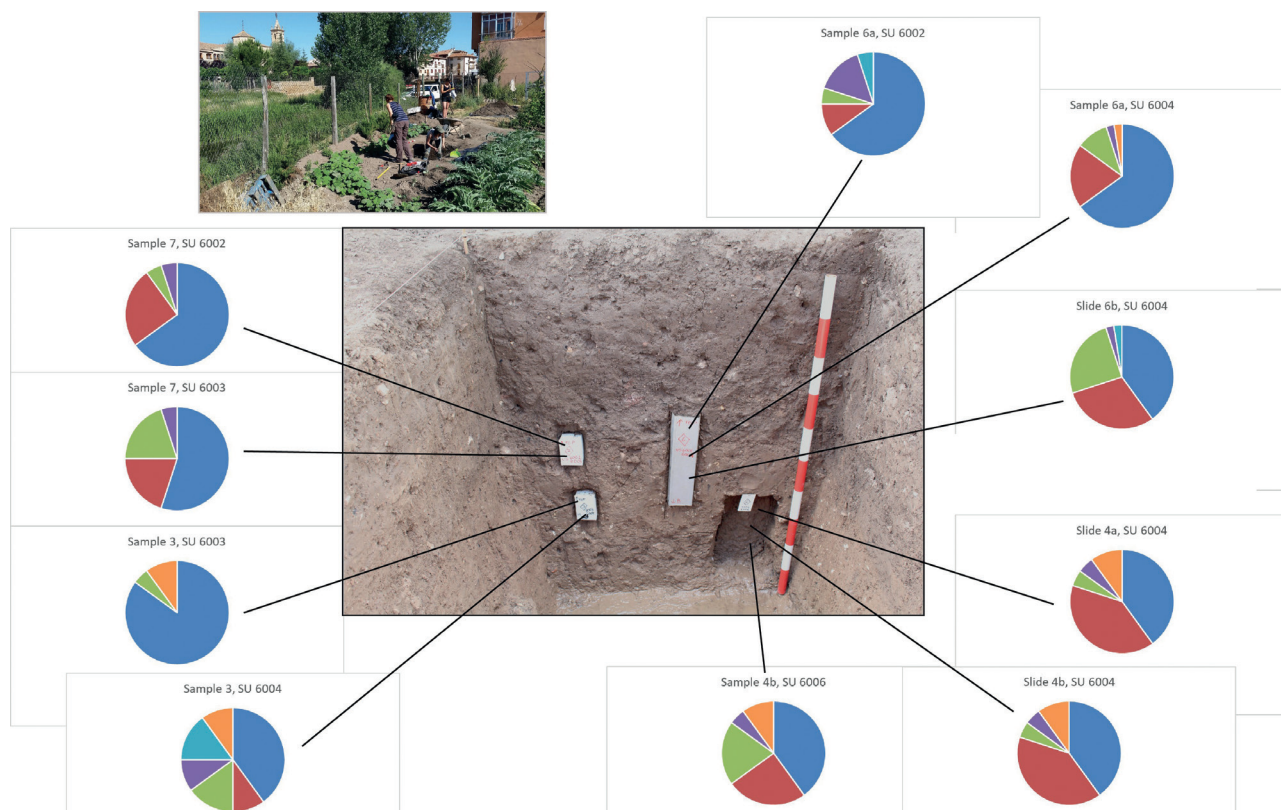


Plate 5.16. The irrigated plots in Molina de Aragón still in use in the present day (top), through which a test trench was dug. The profile is shown in the photograph (centre) and the pie charts show the abundances of inclusions identified in thin section, and the locations from where the analyses were carried out. Pie chart key: geology (dark blue); building materials (red); burnt inclusions (green); activity refuse (purple); dung (light blue); water laid crust aggregates (orange)

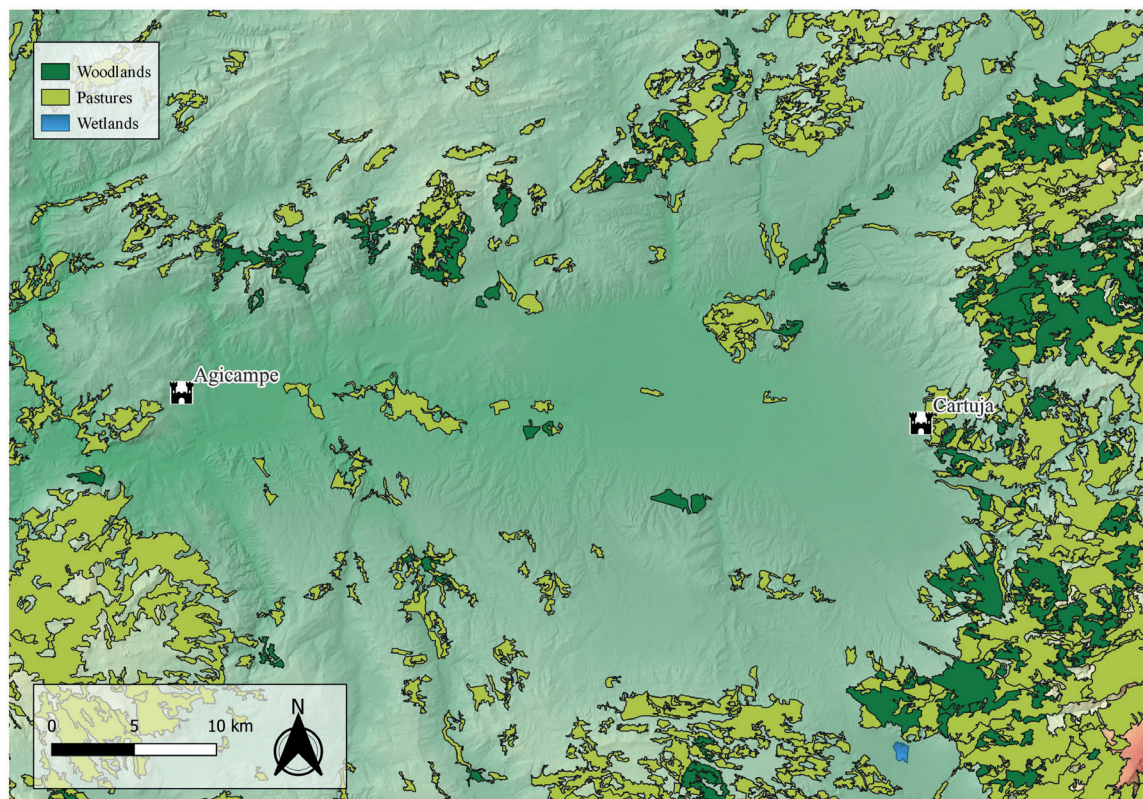


Plate 5.17. Land use map of the Granada plain region



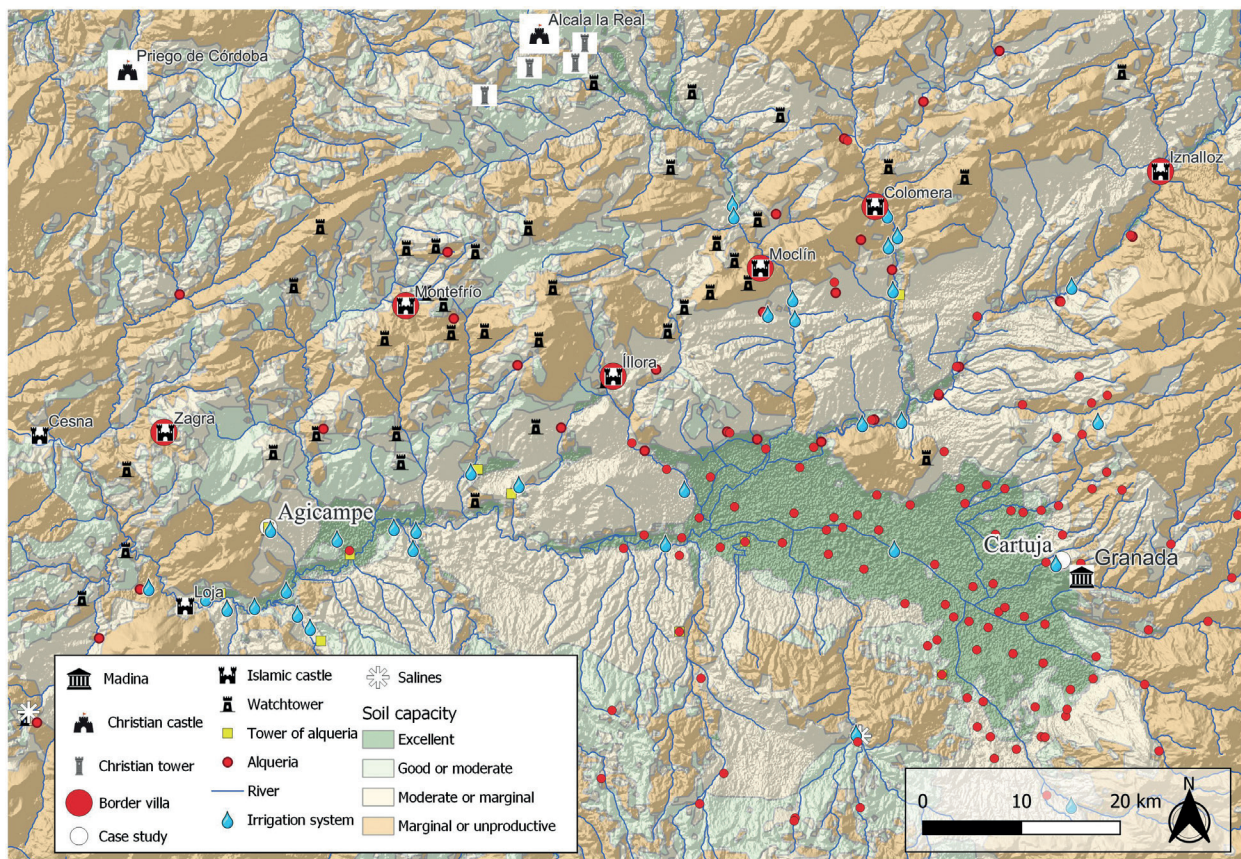


Plate 5.18. Map of Islamic settlements and natural resources in the area from Granada to Loja

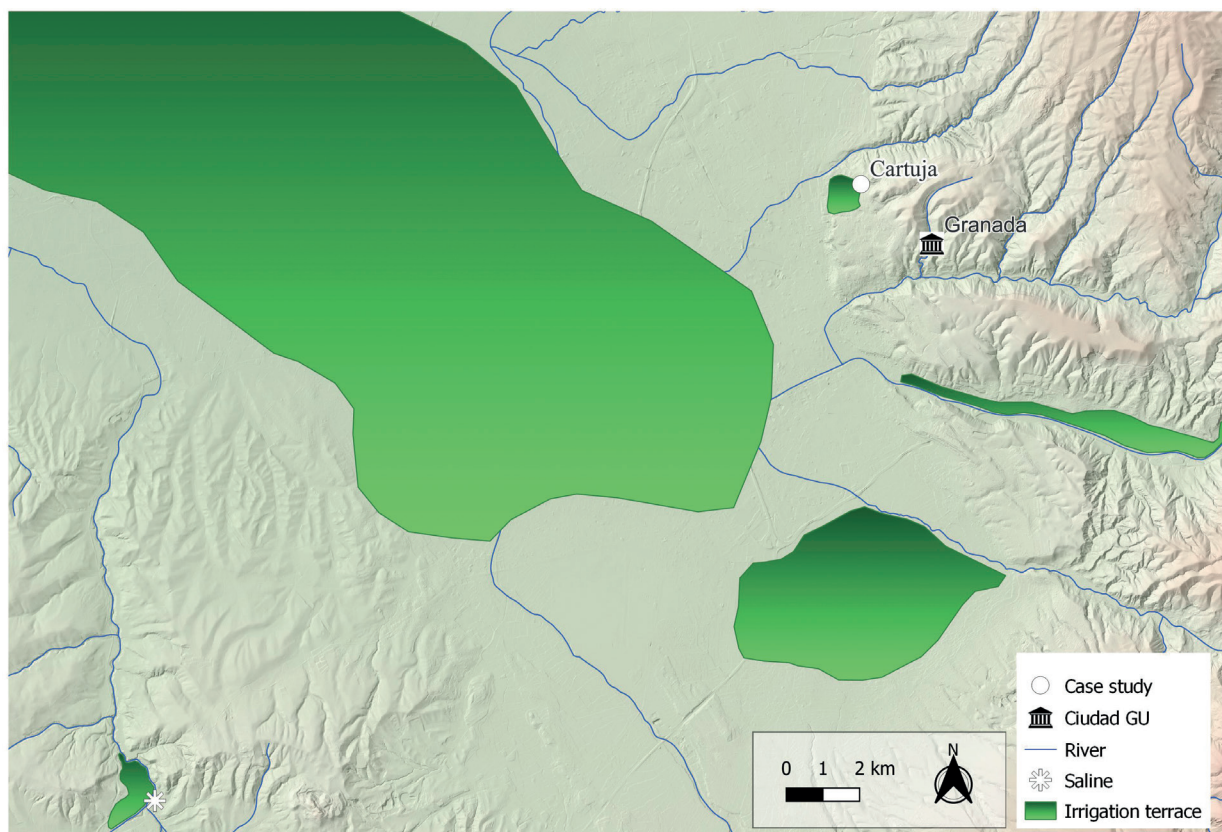


Plate 5.19. Irrigation terraces around Cartuja and Granada



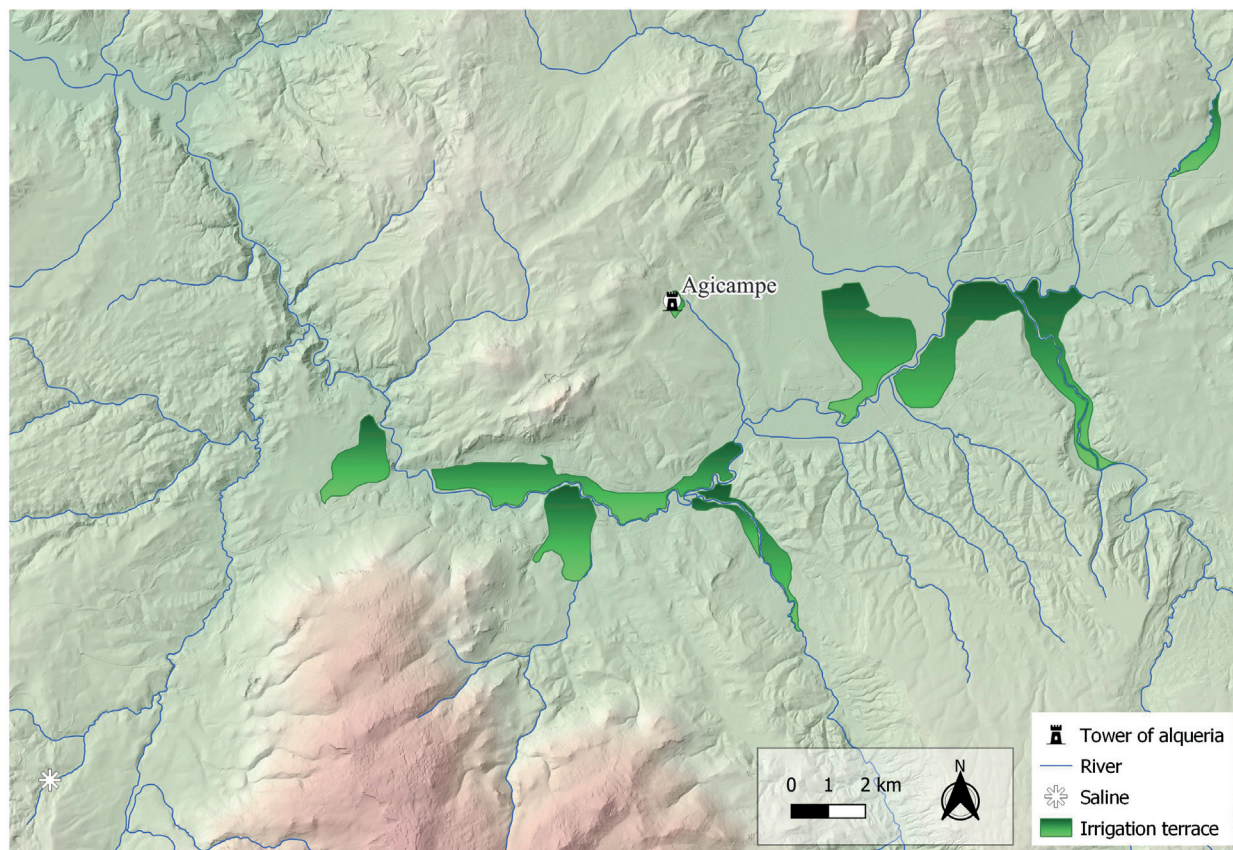


Plate 5.20. Irrigation terraces around Agicampe and Loja

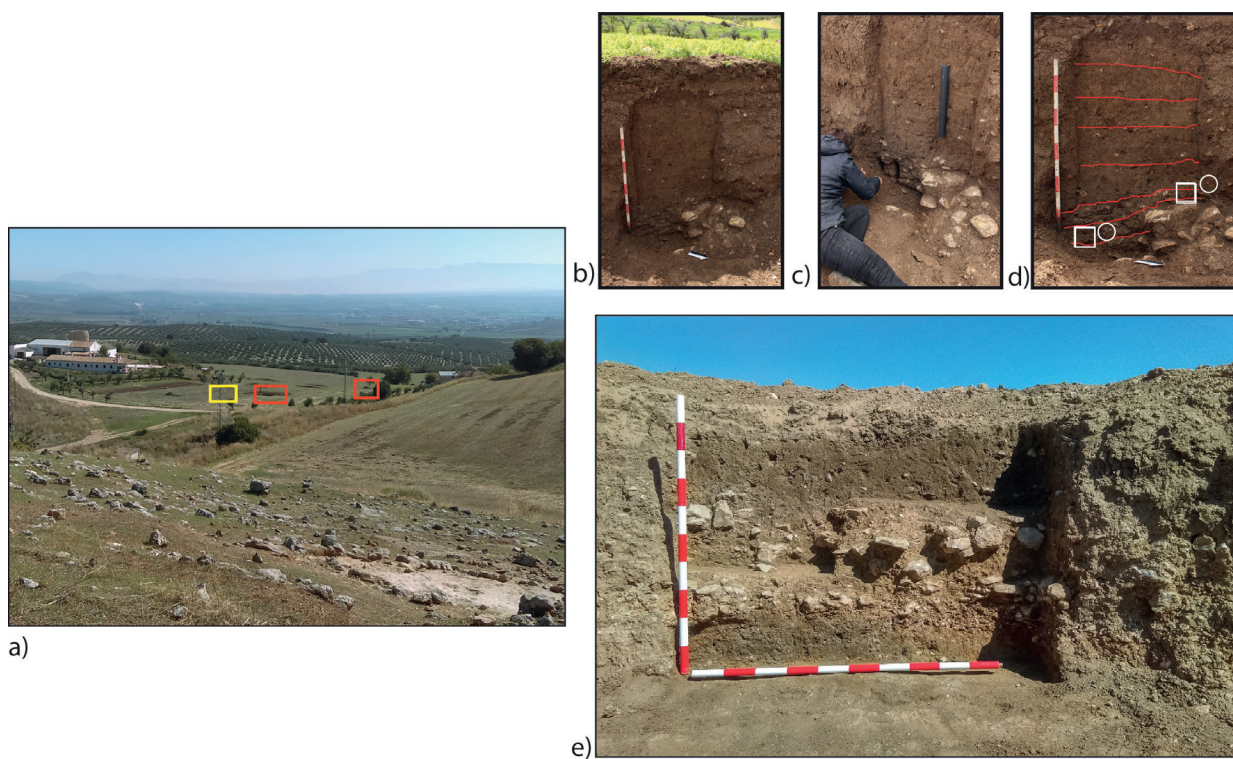


Plate 5.21. Geoarchaeology fieldwork at Agicampe: a) the location of test trenches in spring 2018 (yellow) and autumn 2018 (red), the left red box locates the profile in photo 'e'; b) the profile from spring 2018; c) sampling in progress; d) the white boxes show the locations of soil micromorphology samples and the white circles show the locations of OSL samples; e) the profile from autumn 2018 through the terrace showing its rebuilding phase (with two platforms)



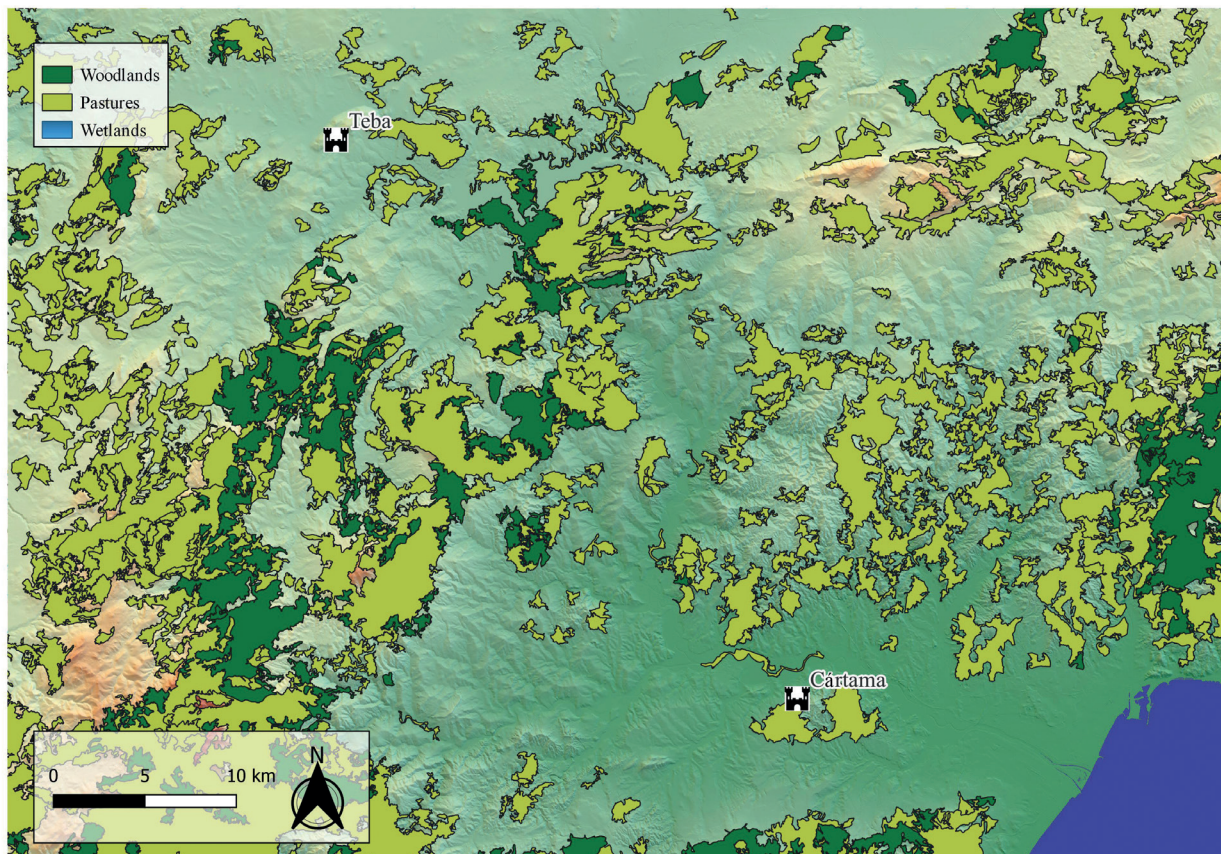


Plate 5.22. Land use map of the Càrtama region

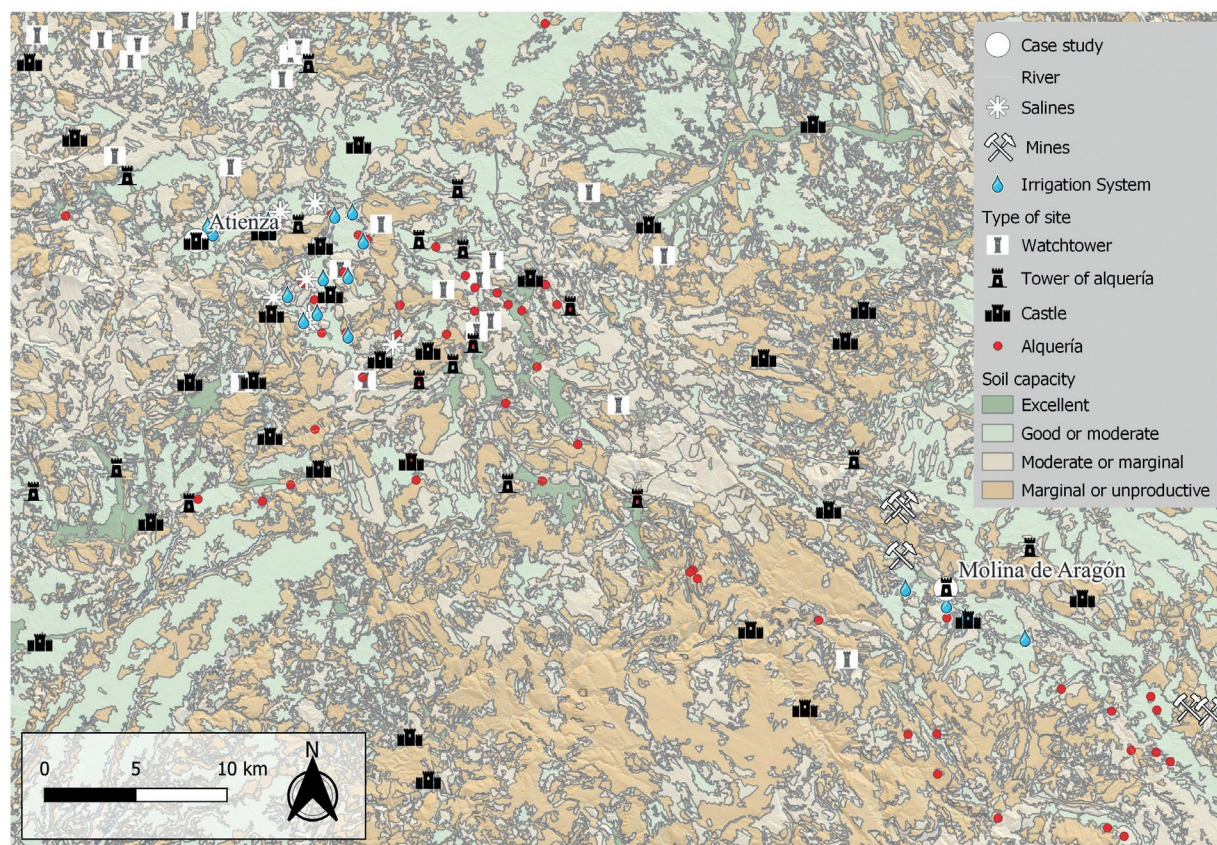


Plate 5.23. Map of Islamic settlements and natural resources in the area from Molina de Aragón to Atienza



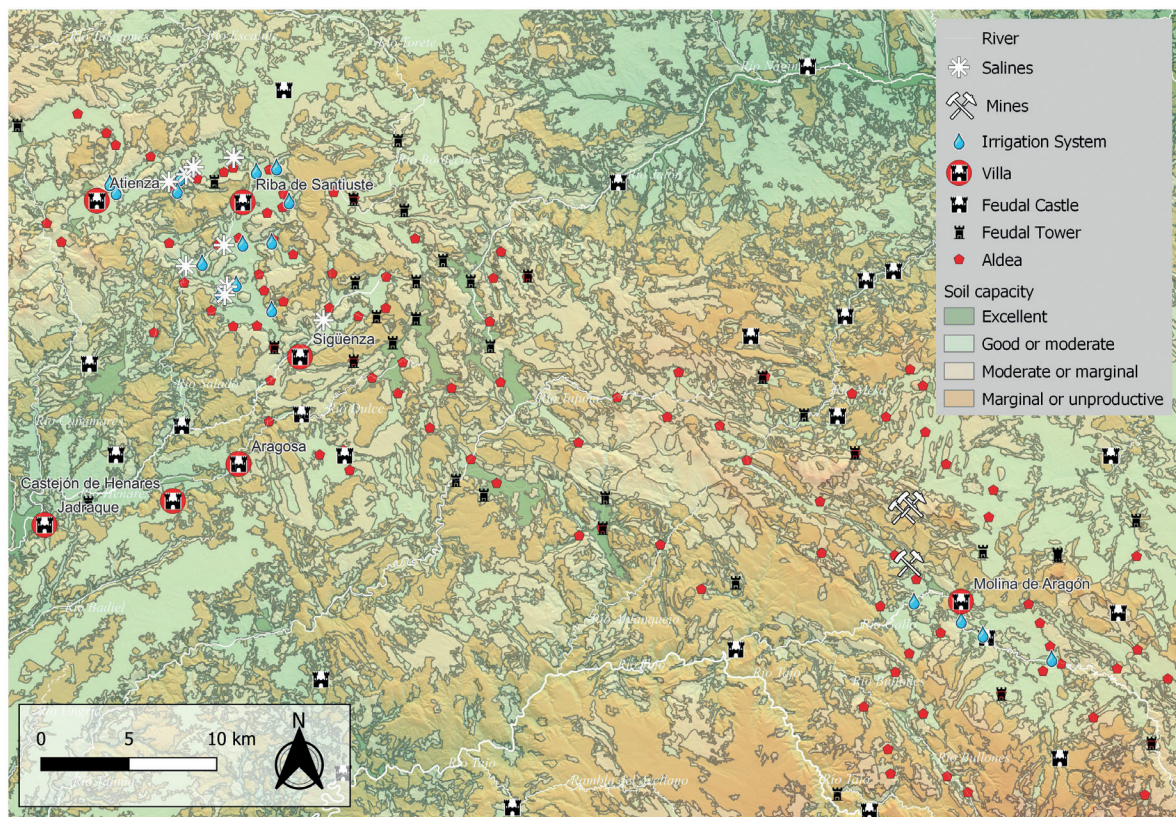


Plate 5.24. Map of feudal settlements and natural resources in the area from Molina de Aragón to Atienza

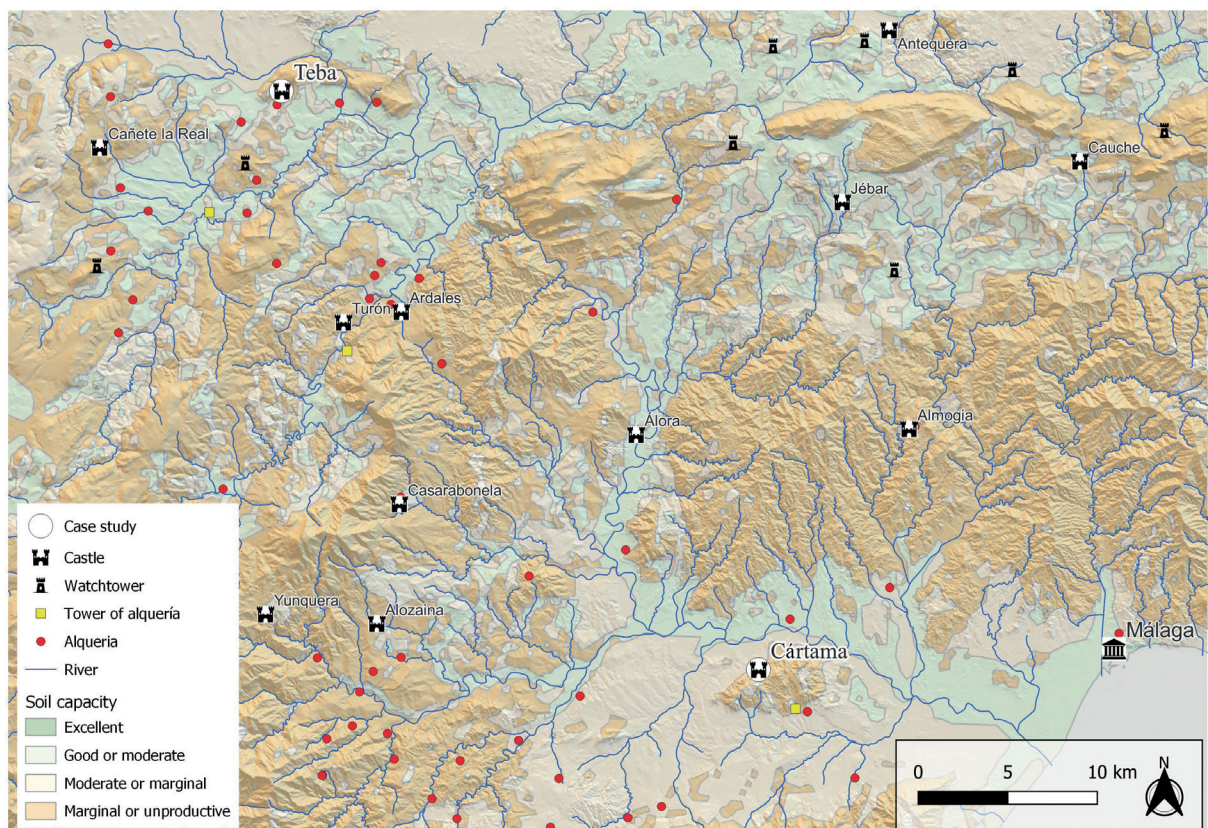


Plate 5.25. Map of Islamic settlements and natural resources from Cártama to Teba



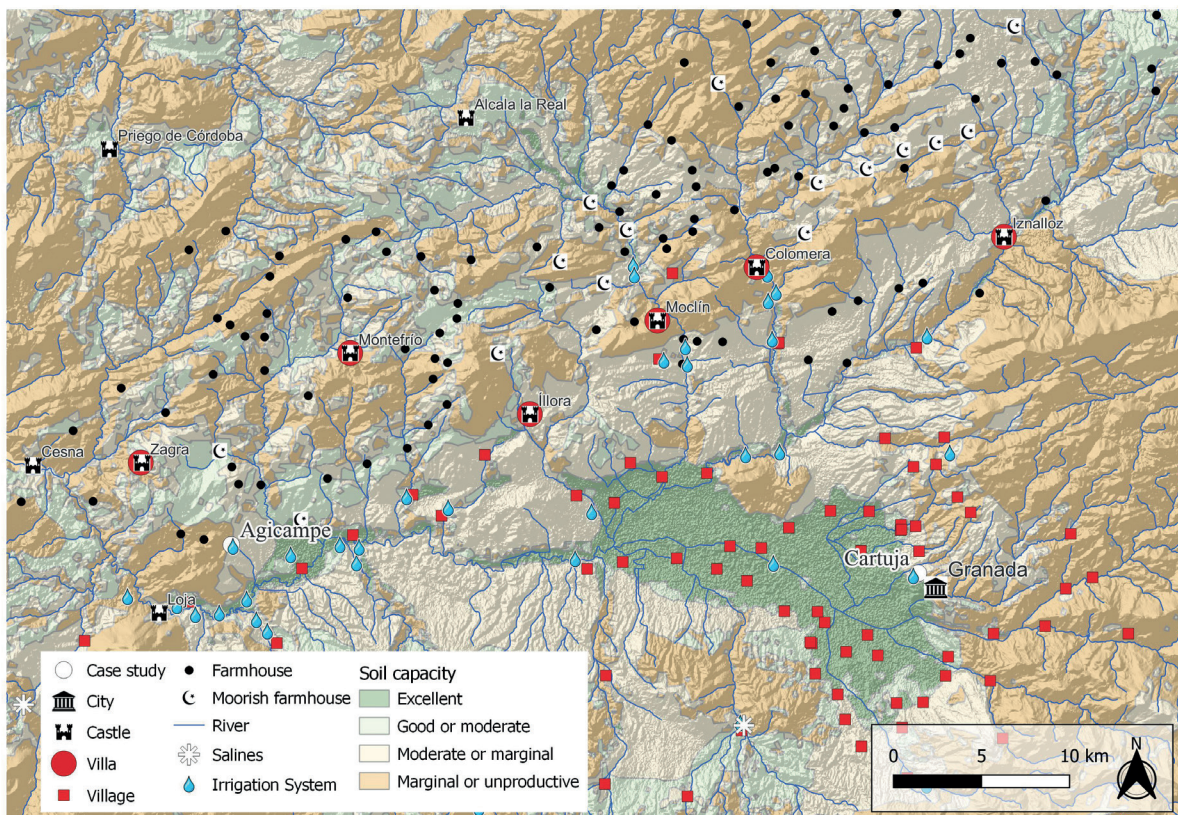


Plate 5.26. Map of Christian settlements and natural resources in the area from Granada to Loja

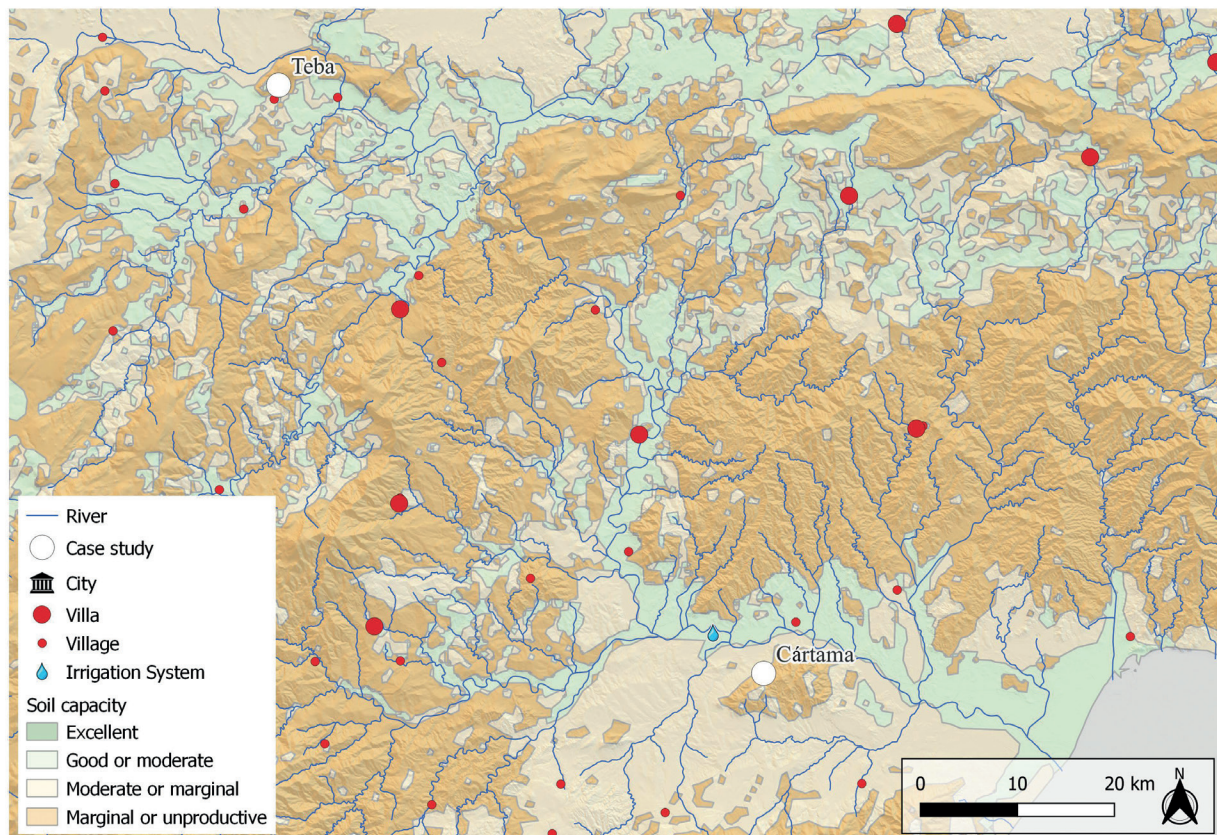


Plate 5.27. Map of Christian settlements and natural resources in the area from Cártama to Teba



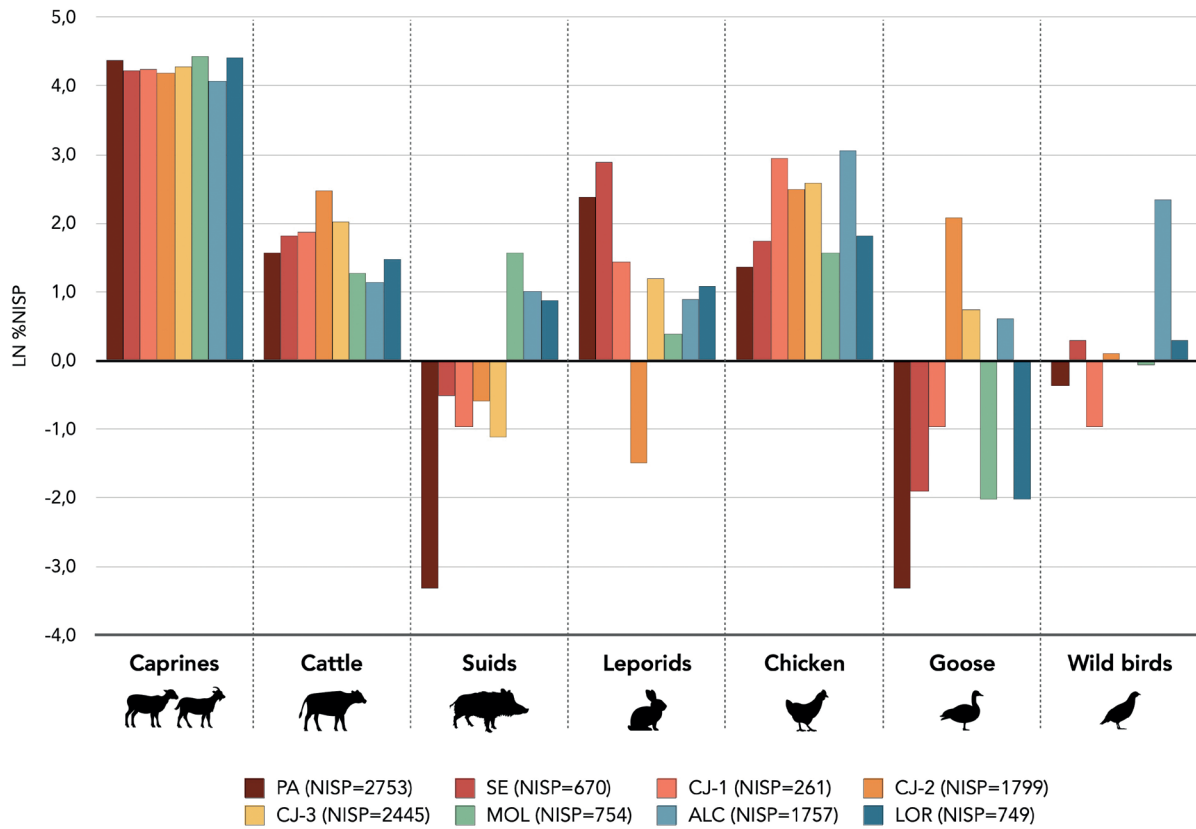


Plate 7.1. Natural logarithms of relative abundance of the main taxonomic groups, based on the data presented in Table 7.2



Plate 7.2. Caprine humeri (a) and femurs (b–c) with numerous cutmarks marks in the medial area, interpreted as evidence of filleting, from the Alcázar Real de Guadalajara (ALC)



Plate 7.3. Caprine humerus (a), pig humerus (b) and caprine femur (c) with marks of thermo-alteration that affect only well-defined sections, suggesting the roasting of the meat on the bone



Plate 7.4. Examples of femurs with marks of porging (nikkur) in CJ-2 (a–b), LOR (c) and PA (d–f)

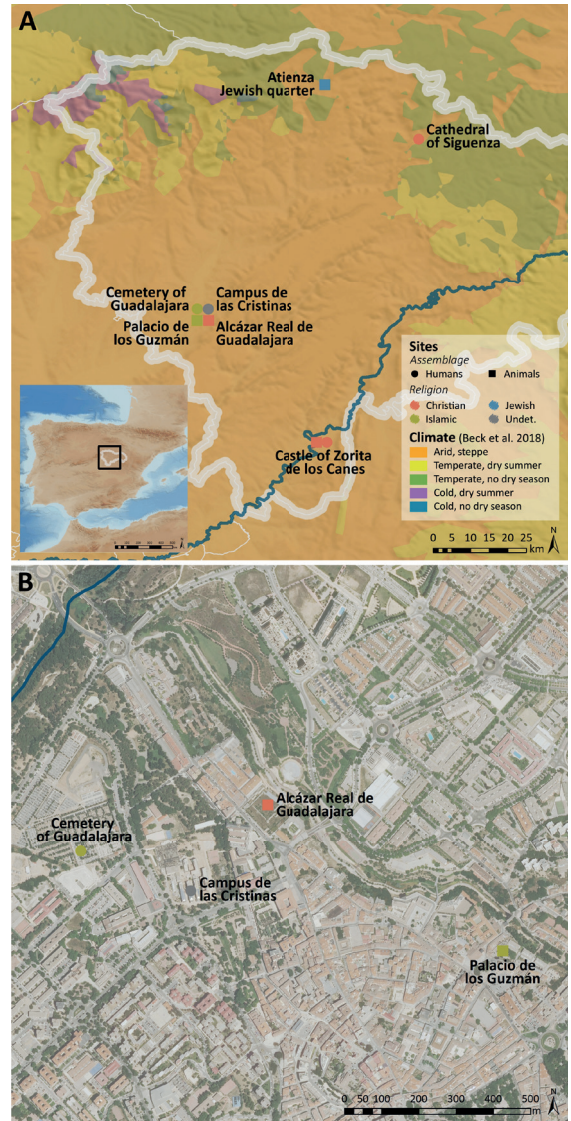


Plate 8.1. Location of the sites sampled for the Landscapes of (Re)Conquest project: (A) West of Guadalajara province, (B) Guadalajara city

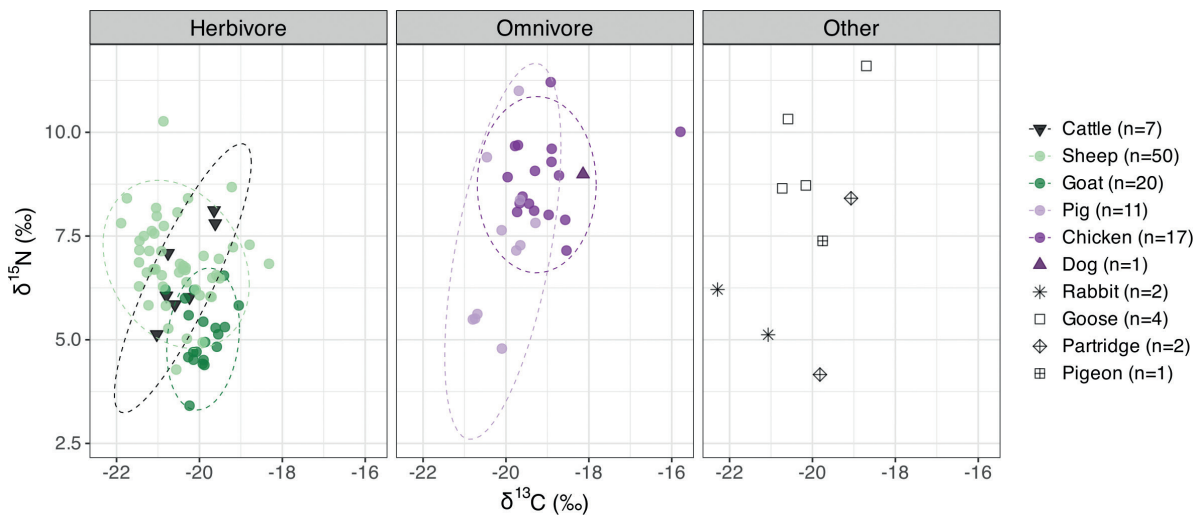


Plate 8.2. Carbon and nitrogen stable isotope ratios of mammal and bird samples from Alcázar Real de Guadalajara (ALC), grouped by species and dietary regime. 95% confidence ellipses are shown for species with > 4 data points



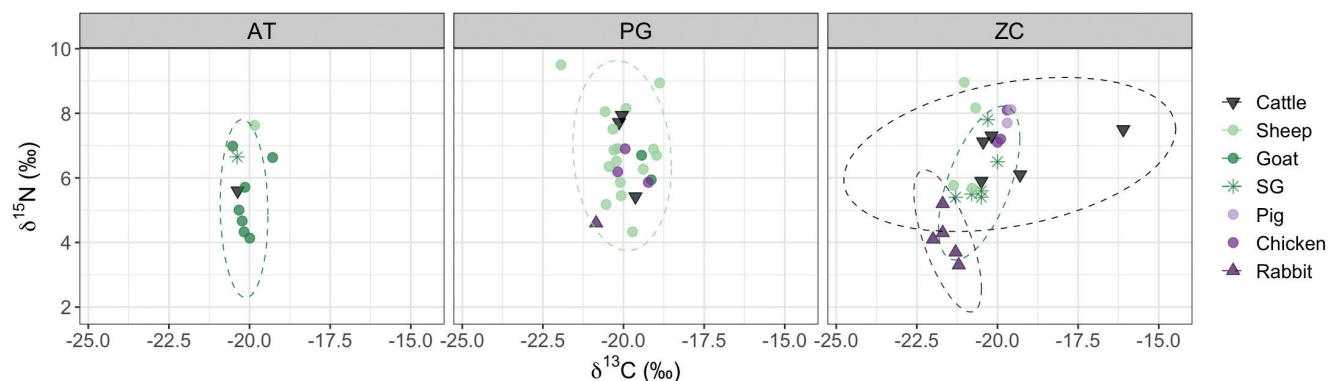


Plate 8.3. Carbon and nitrogen stable isotope ratios of mammal and bird samples from Atienza Jewish quarter (AT), Palacio de los Guzmán (PG) and Castle of Zorita de los Canes (ZC), grouped by species. 'SG' denotes sheep/goat for published data from ZC where these species were not differentiated. 95% confidence ellipses are shown for species with > 4 data points (Krzywinski and Altman 2014). For sample sizes, see Table 8.2

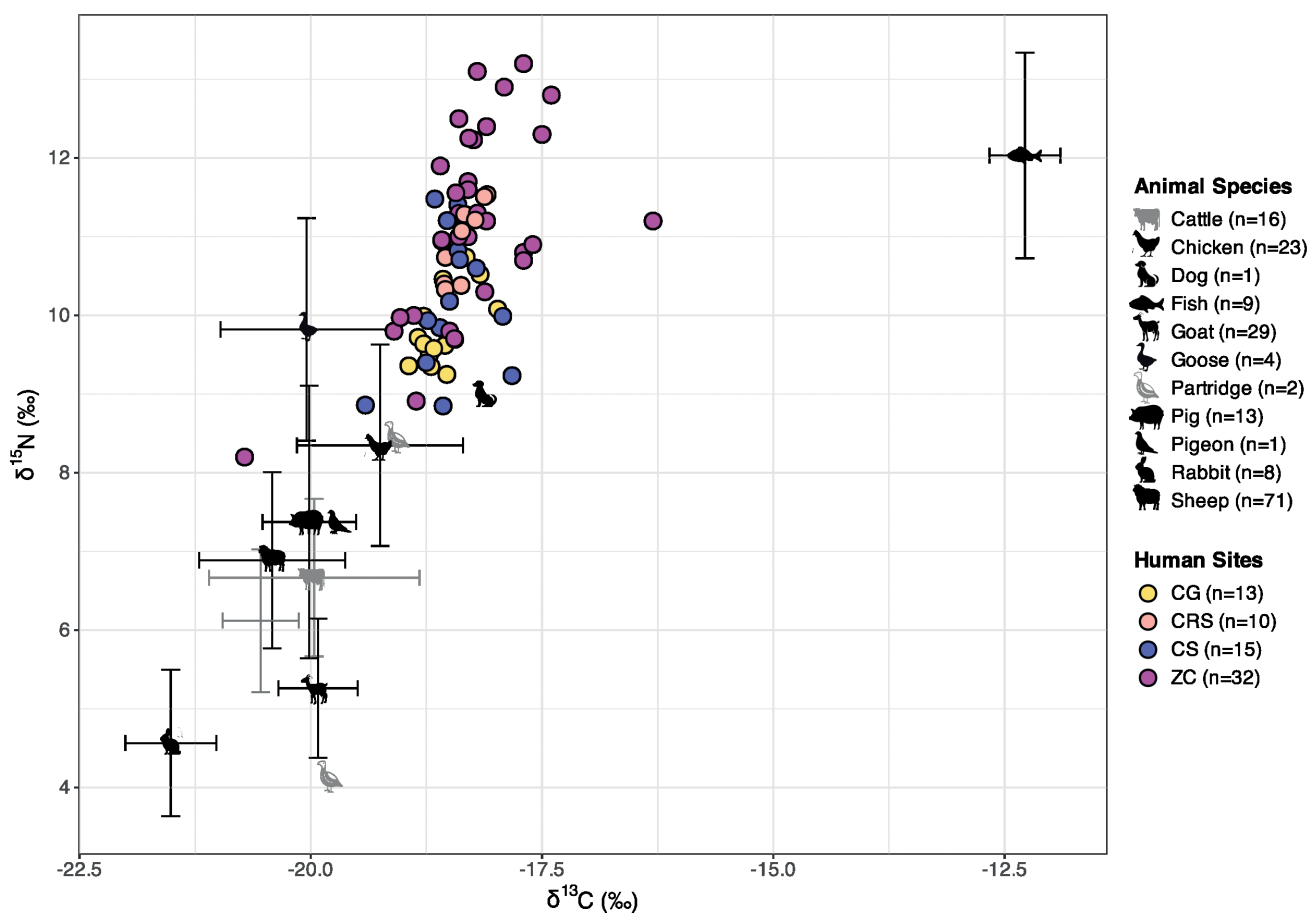


Plate 8.4. Carbon and nitrogen stable isotope ratios of human samples from Cemetery of Guadalajara (CG), Campus de las Cristinas (CRS), Cathedral of Sigüenza (CS) and Castle of Zorita de los Canes (ZC, including those from Pérez-Ramallo et al. (2024), plotted against animals from all sites. Due to the lack of isotopic differentiation, individuals from both periods of CG were plotted together. Error bars represent the mean  $\pm$  1 standard deviation for species represented by > 2 individuals

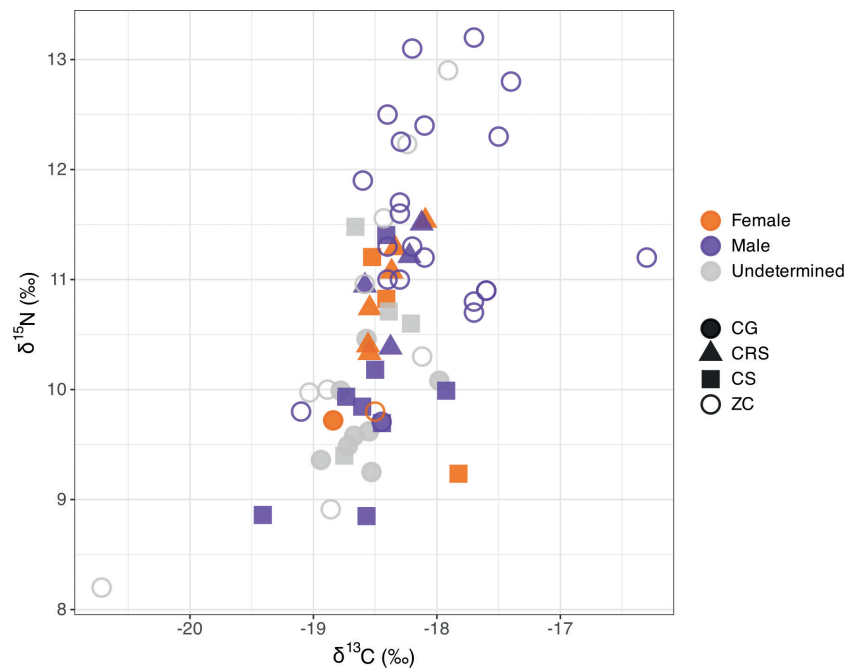


Plate 8.5. Carbon and nitrogen stable isotope scatterplot of individuals identified as male, female and undetermined sex from Cemetery of Guadalajara (CG), Campus de las Cristinas (CRS), Cathedral of Sigüenza (CS) and Castle of Zorita de los Canes (ZC, including those from Pérez-Ramallo et al. (2024)

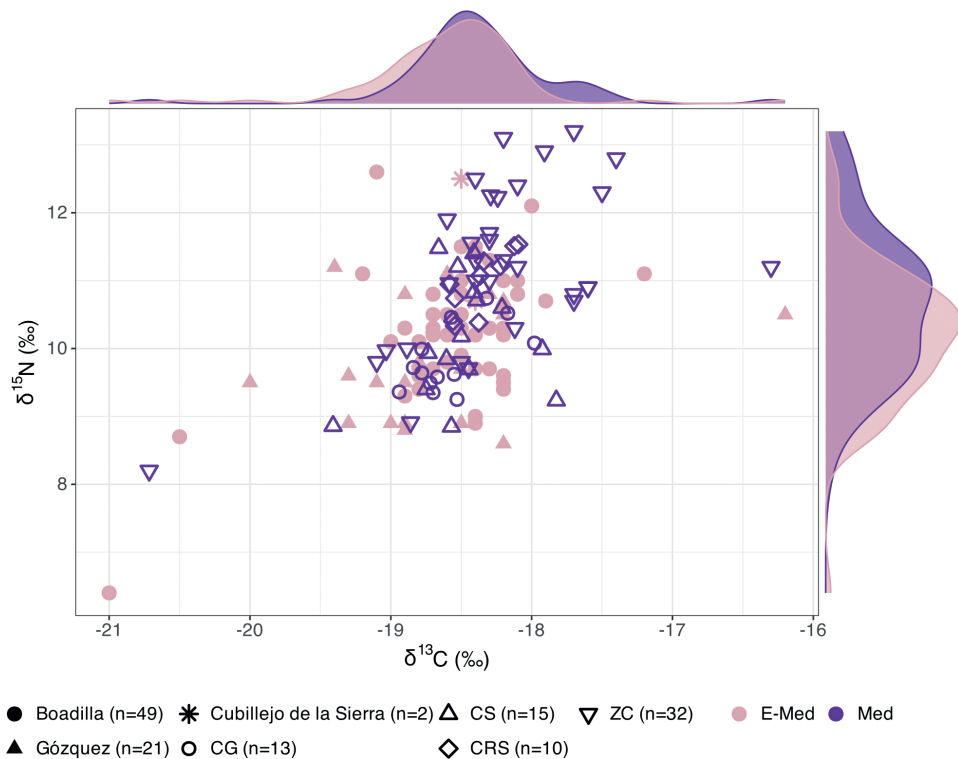


Plate 8.6. Carbon and nitrogen stable isotope scatterplot comparing late medieval sites in Guadalajara (CG: Cemetery of Guadalajara, CRS: Campus de las Cristinas, CS: Cathedral of Sigüenza, ZC: Castle of Zorita de los Canes, including those from Pérez-Ramallo et al. (2024) to published data from the early medieval cemeteries of Boadilla (García-Collado et al. 2019), Gózquez (García-Collado 2016) and Cubillejo de la Sierra (Peralta et al. 2022)

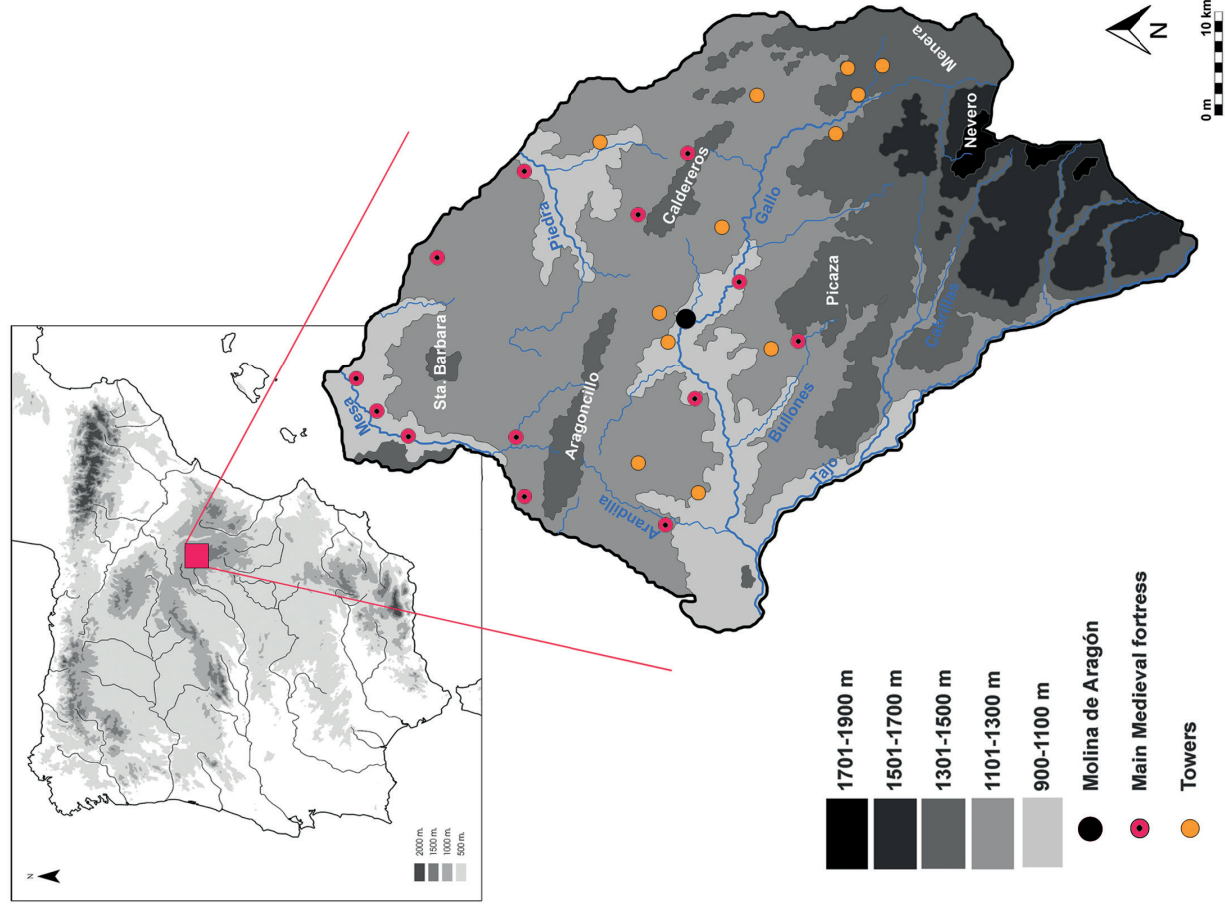


Plate 9.1. Localisation and extension of the Lordship of Molina de Aragón under the feudal lordship of the Laras (c. 12th–14th centuries), including topography, water courses and the network of castles and towers. On the right, photographs of the town of Molina and its landscape



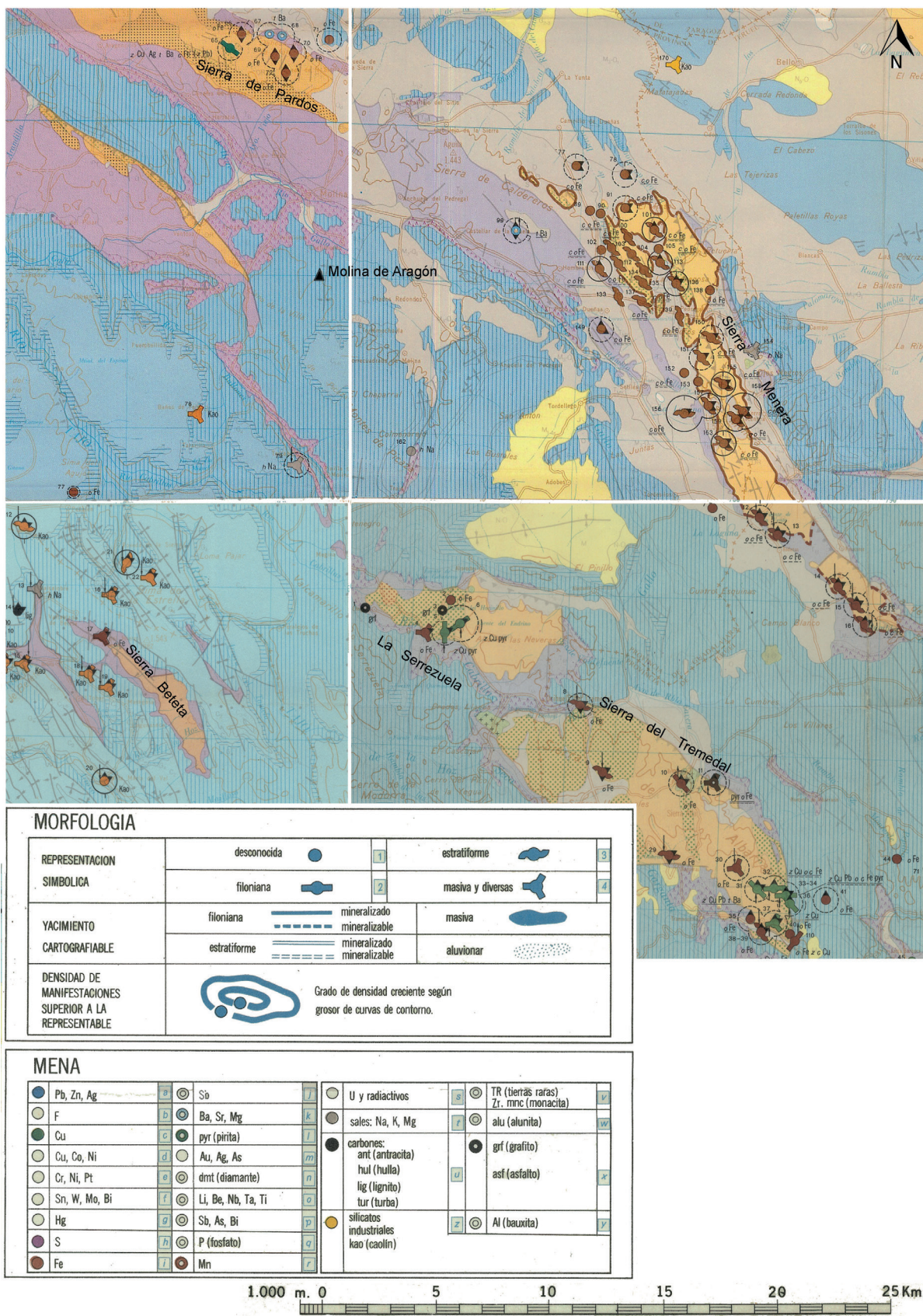


Plate 9.2. Metallogenetic map of the area around Molina de Aragón (Guadalajara) overlapping the Sigüenza (39), Daroca (40), Cuenca–Guadalajara (46) and Teruel (47) sheets of the Metallogenetic Map of Spain, scale 1:200,000 (old series) (Source: modified from IGME cartography)

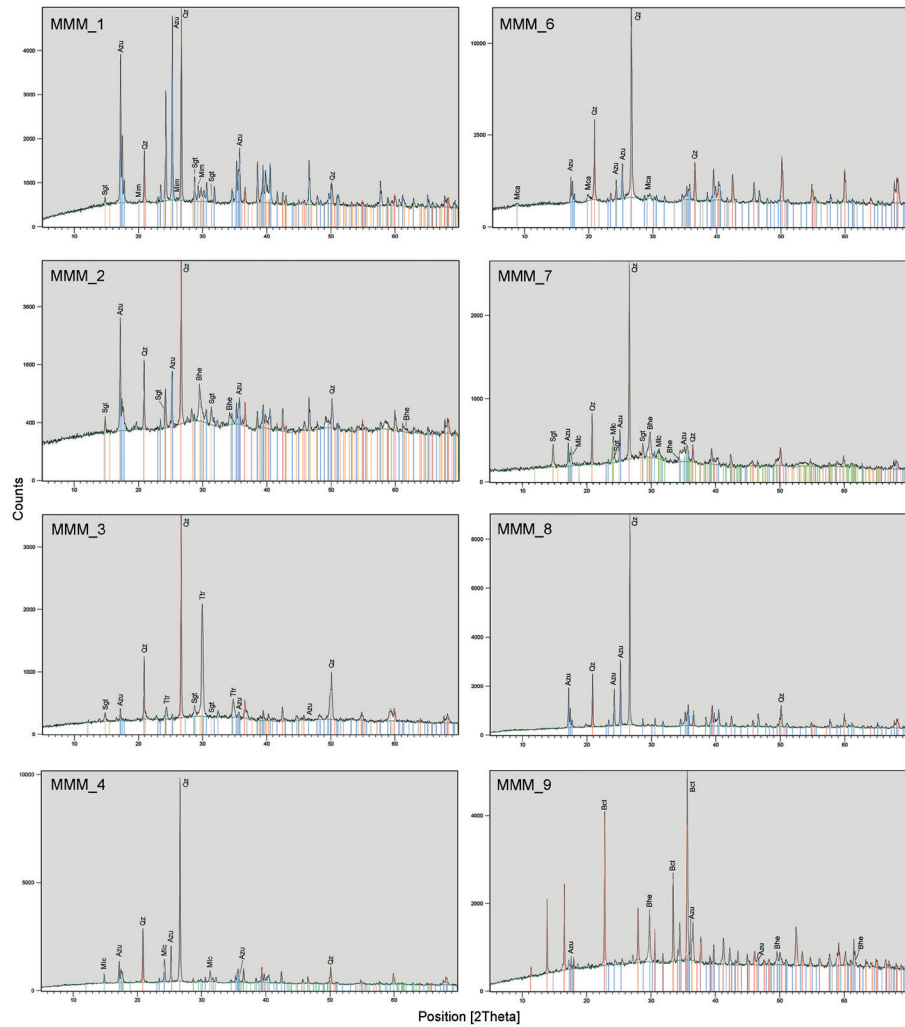


Plate 9.3. Map of the Lordship of Molina, comparing the Andalusí and the feudal settlement patterns and access to mineral resources

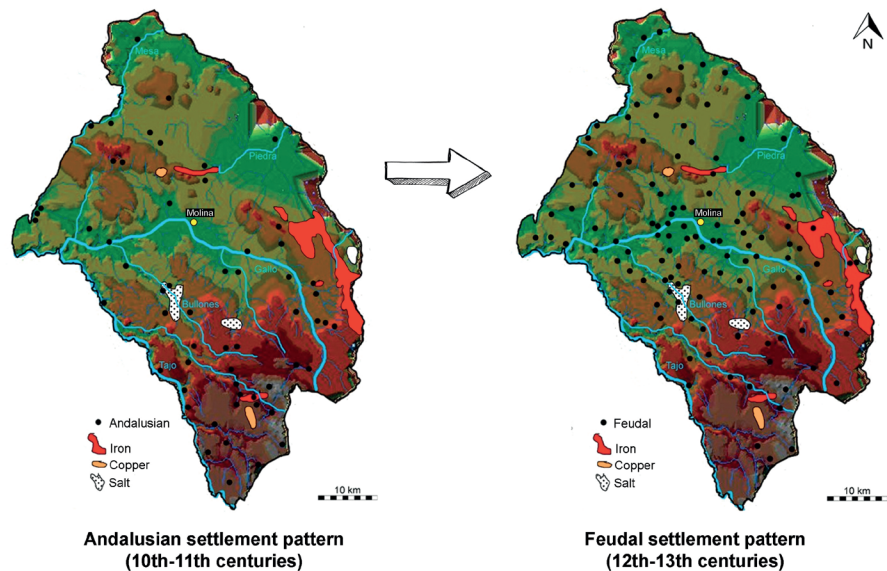


Plate 9.4. DRX diffractograms of geological copper ores from Mina La Estrella in Pardos (MMM\_1–MMM\_6) and archaeological samples from the Jewish quarter of Molina (MMM\_7–MMM\_9). Azurite (Azu), bindheimite (Bhe), brochantite (Bct), malaquite (Mlc), mica-group phyllosilicates (Mca), mimetite (Mim), quartz (Qz), segnitite (Sgt) and tetrahedrite (Ttr) (mineral symbols according to Warr 2021). (Carried out at Servicio de Rayos X, Unidad de Rocas y Minerales, UPV)



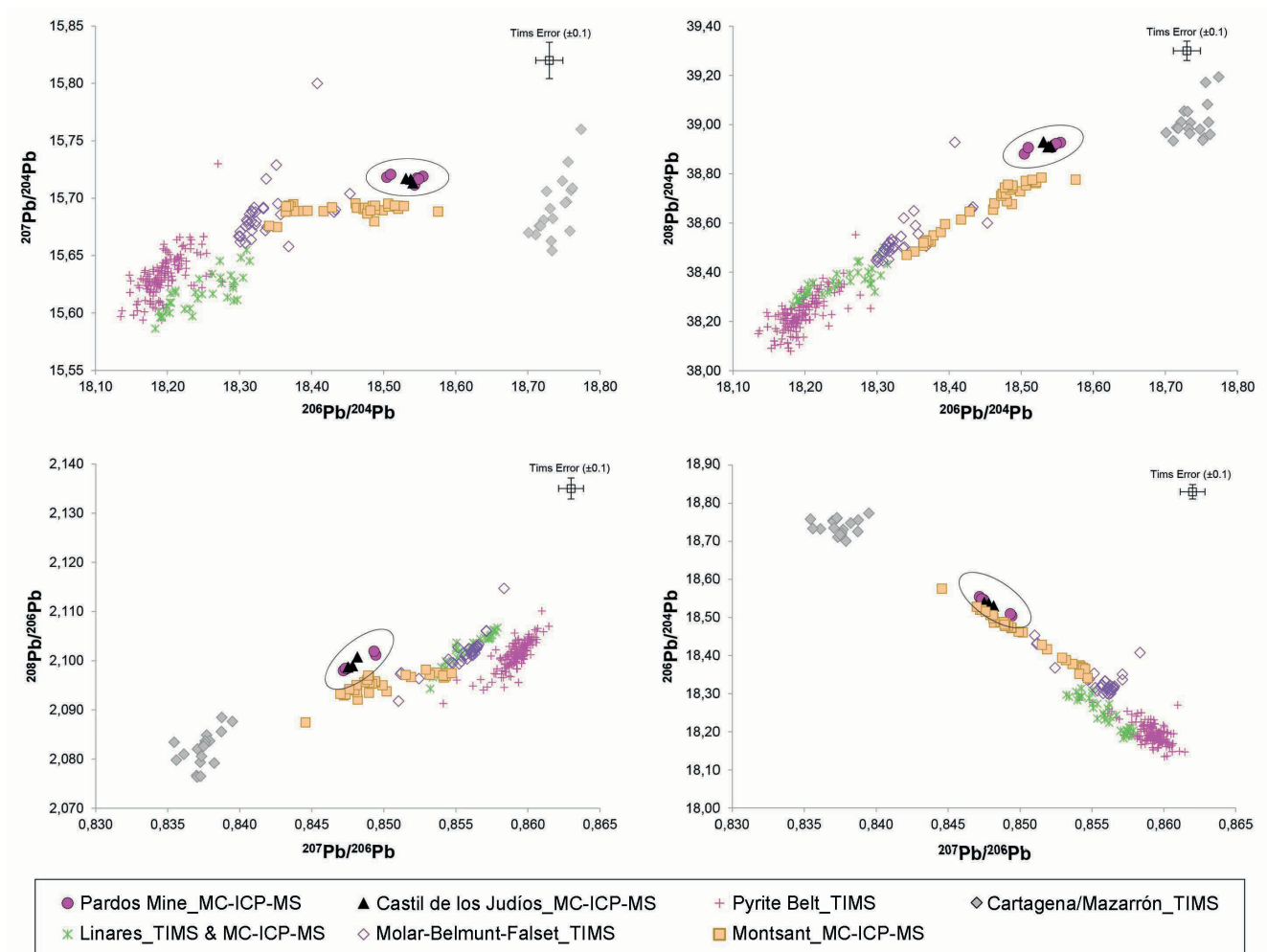


Plate 9.5. Bivariate graphs comparing isotopic ratios; the copper minerals from the Jewish quarter group together within the isotopic field corresponding to Mina La Estrella of Pardos. The error of the samples analysed by TIMS is expressed, excluding the smaller MC-ICP-MS error



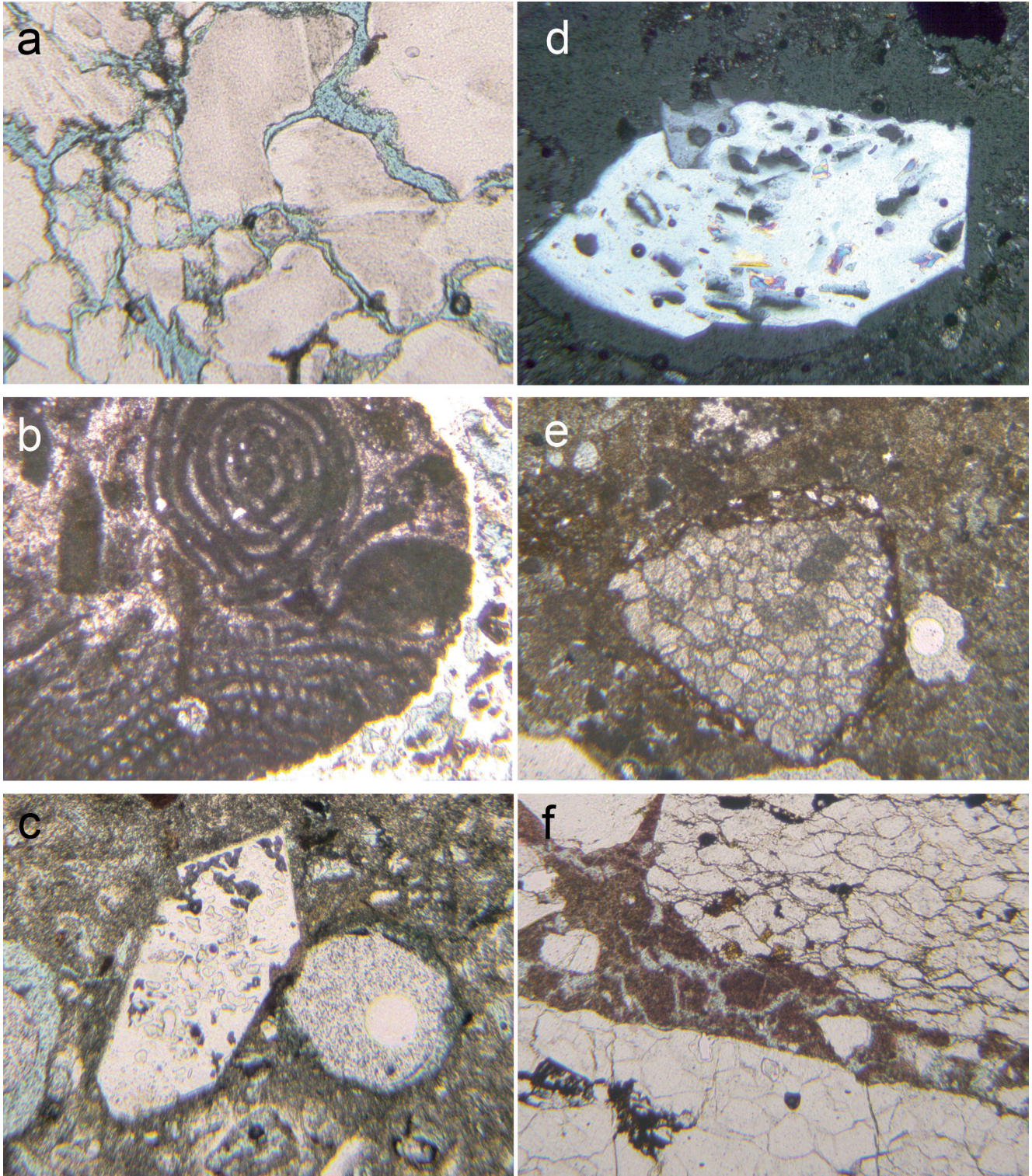


Plate 10.1. a) Gypsum outcrop Gerb, Belaguer PPL Field of View 2.4mm; b) Lime mortar Saint Llorenç de Montgai Castle. Noguera valley showing distinctive Benthic Foraminifera from surrounding Eocene to Miocene limestone on which this fortification is perched PPL Field of View 2.4mm; c) Gypsum mortar – tapial Torre de Aragón (ARAG 28) hexagonal gypsum crystals PPL Field of View 2.4mm; d) Gypsum mortar bedding mortar Torre Atalaya de Los Casares (ARAG 12) hexagonal gypsum crystals XPL Field of View 2.4mm; e) Chalky gypsum mortar herringbone walling internal face Molina de Aragón (ARAG 26) – crushed gypsum matrix and relict tapial PPL Field of View 2.4mm; f) Pebbly Tapial Tower 2 Molina de Aragón (ARAG20) PPL Field of View 2.4mm





*Plate 10.2. a) Rectangular shaped tapial formwork Molina de Aragón Tower 2 showing rectangular rammed earth formwork; b) Close up of hard pebbly tapial Molina de Aragón Tower 4; c) Christian Outer defensive circuit wall near Jewish quarter Molina de Aragón showing lumps of slag*



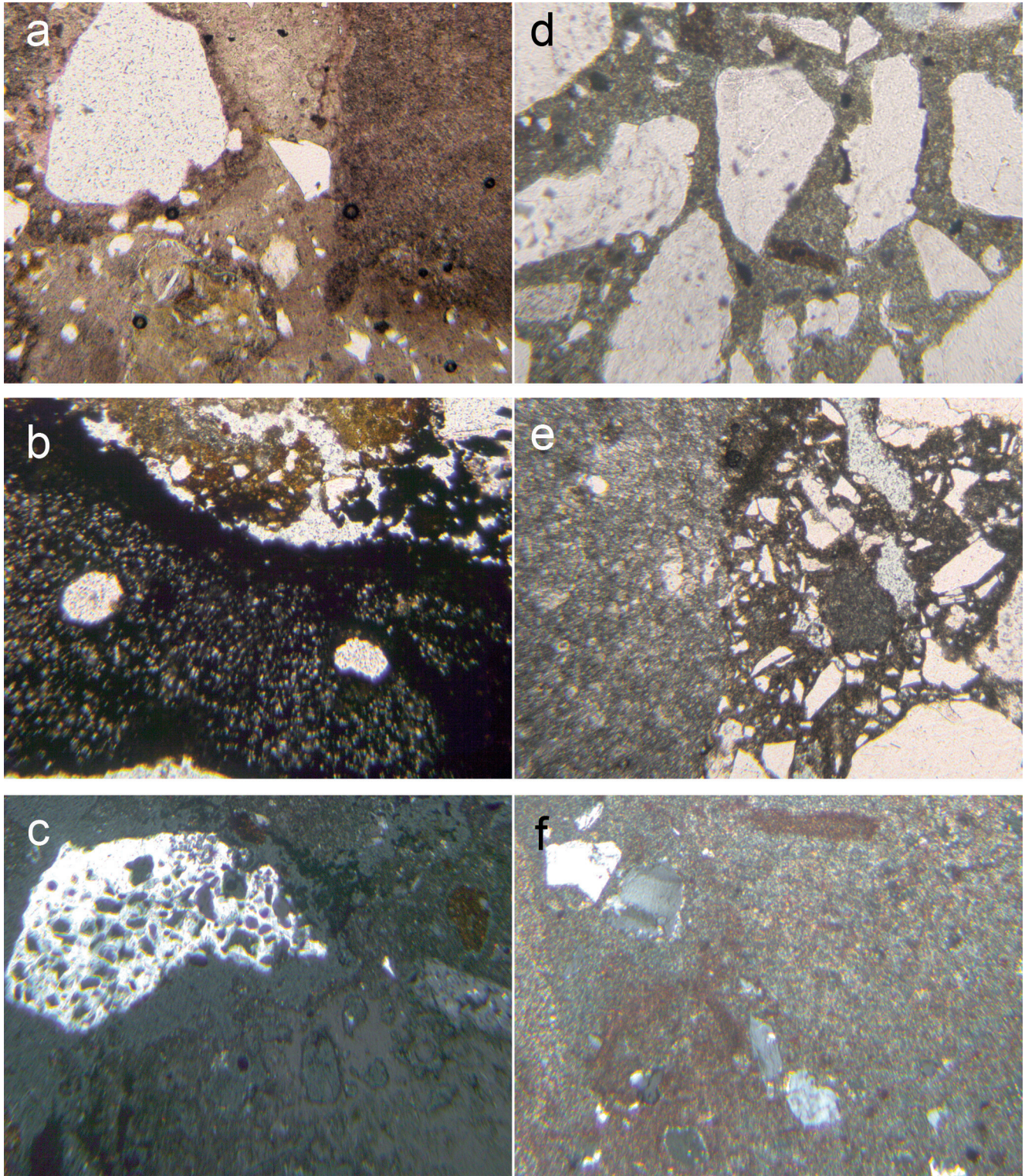


Plate 10.3. a) Christian sandy lime mortar with slaked lime external perimeter wall, between Towers 4 and 5 Molina de Aragón (ARAG14–15) showing white 'floating quartz' (left) PPL Field of View 2.4mm; b) Christian sandy lime mortar with slaked lime perimeter wall, towards Jewish quarter. Molina de Aragón (ARAG24) showing nodular grey slag (left) PPL Field of View 2.4mm; c) Gypsum mortar Islamic tower above herringbone walling Atienza (ARAG34) gypsum in a quartz deficient matrix XPL Field of View 2.4mm; d) Gritty sandy mortar Christian I perimeter wall Atienza (ARAG38), large, well-packed angular quartz in a poorly developed lime matrix PPL Field of View 2.4mm; e) Sandy lime mortar with fossil mudstone Christian 2 bastion Atienza (ARAG40) PPL Field of View 2.4mm; f) Dissolved hexagonal gypsum Cistern 1 Atienza (ARAG33) XPL Field of View 2.4mm



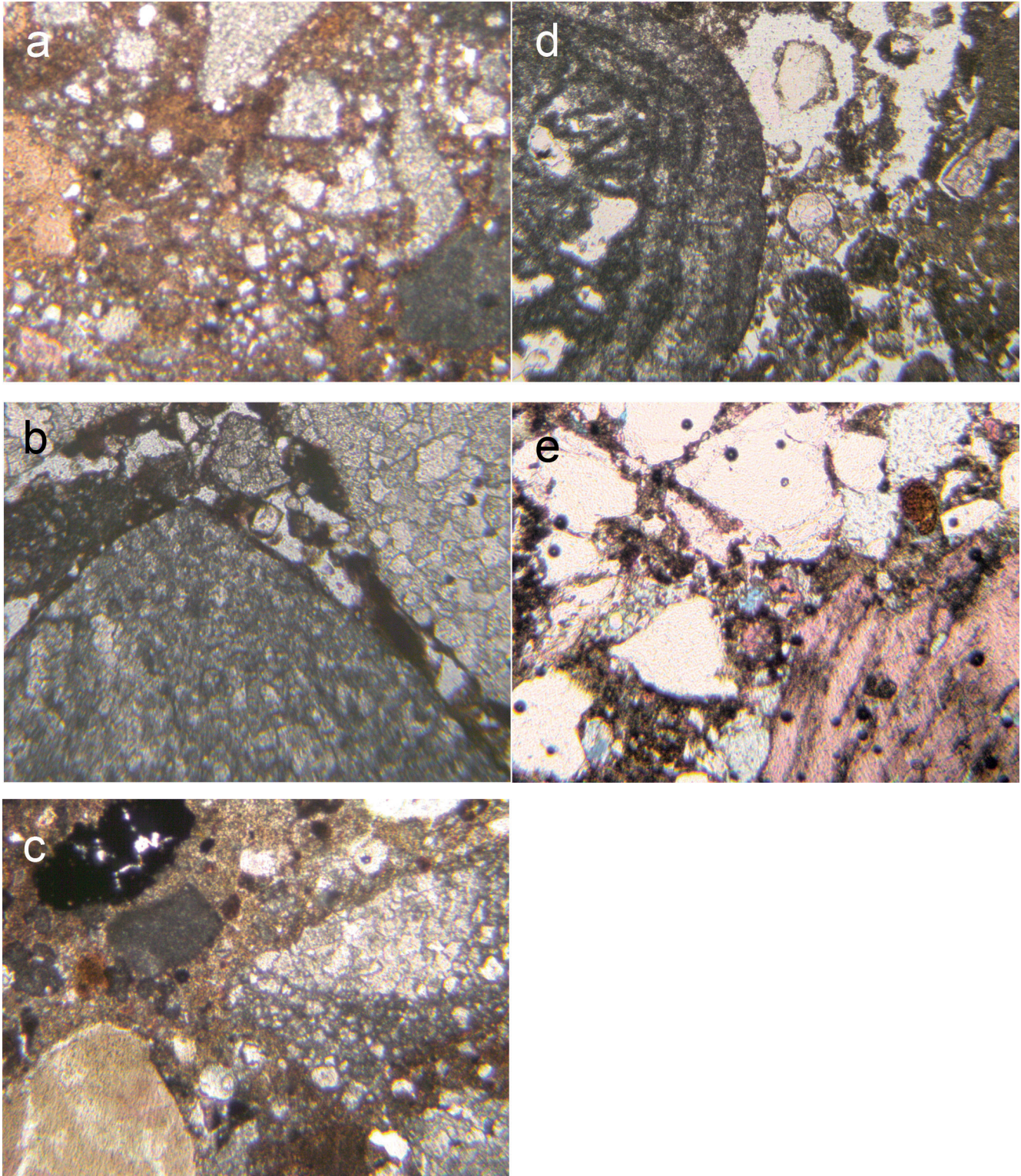


Plate 10.4. a) Nasrid 1 fine lime tapial base Tower B Moclin (GRAN 5) showing numerous small calcareous silt mud agglomerates with a dark mud olistostrome (bottom right) in a fine homogeneous dark brown lime mud PPL Field of View 2.4mm; b) Nasrid 1 Lime gravel tapial (GRAN 4) Tower C Moclin (GRAN 4) showing large calcareous mud agglomerates 1mm across PPL Field of View 2.4mm; c) Nasrid 2 Lime gravel tapial with charcoal (GRAN 6) Tower E Moclin showing black charcoal (top left), white calcareous mud agglomerates PPL Field of View 2.4mm; d) Nasrid 2 Pebbly hard dolomitic mortar (GRAN 8) outer enclosure wall Moclin Jurassic limestone grapestone bonded in fine lime matrix PPL Field of View 2.4mm; e) Christian gritty lime bedding mortar (GRAN 2) Tower E Moclin PPL Field of View 2.4mm



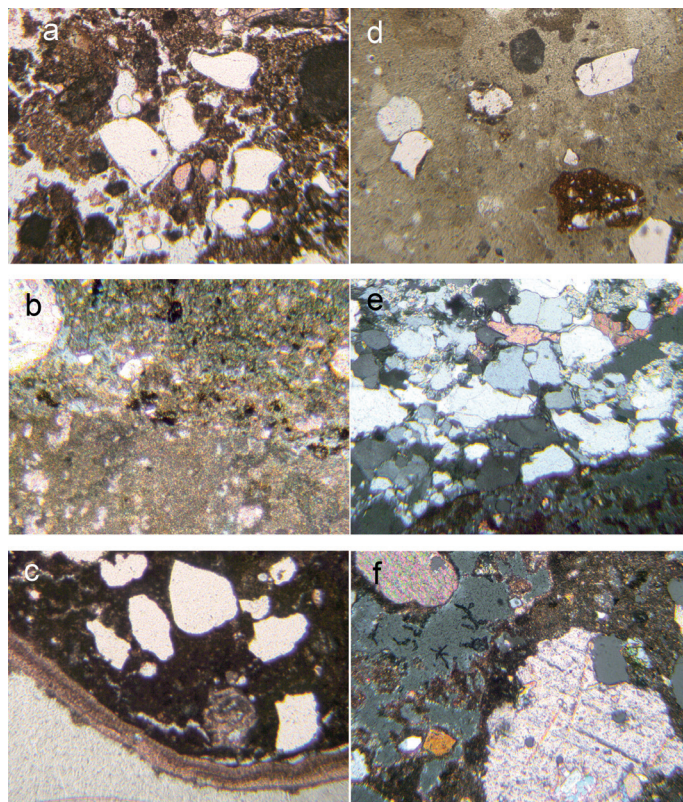
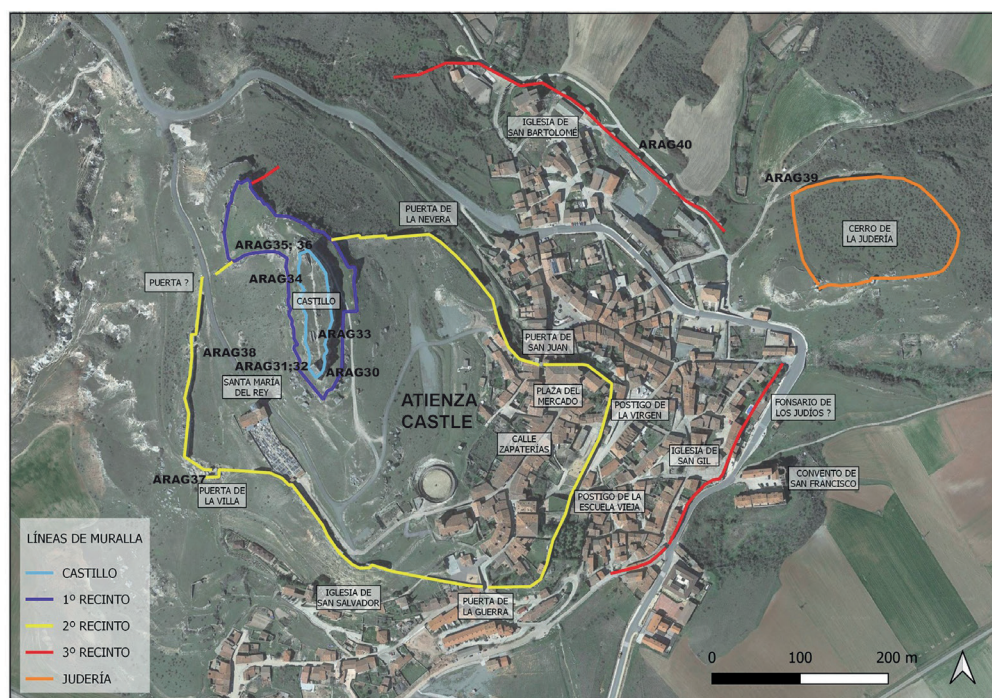


Plate 10.5. a) Nasrid 1 gritty tapial (GRAN23) Teba showing large quartz inclusions and cracks in the poorly consolidated rammed earth PPL Field of View 2.4mm; b) Nasrid 2 fine lime tapial (GRAN22) Teba formwork – silty and muddy layers of rammed earth PPL Field of View 2.4mm; c) Nasrid 2 Fine chalky white lime mortar red brown ceramic tile (GRAN16) Teba Tower D PPL Field of View 2.4mm; d) Christian lime sandy shelly mortar (GRAN15) Outer enclosure wall bedding mortar Teba showing thick shell and laminae in a fine calcite mud groundmass and white ‘floating quartz’ PPL Field of View 2.4mm; e) Nasrid sandy lime sandy mortar (GRAN 24) facing mortar early fortress Cartama meta-quartzite rock fragment from underlying metamorphic rock hilltop bottom centre XPL Field of View 2.4mm; f) Nasrid sandy lime sandy mortar (GRAN 24) facing mortar early fortress Cartama orthopyroxene crystal bottom centre from underlying amphibolite XPL Field of View 2.4mm



*Plate 10.6. Atienza castle mortar sample location*

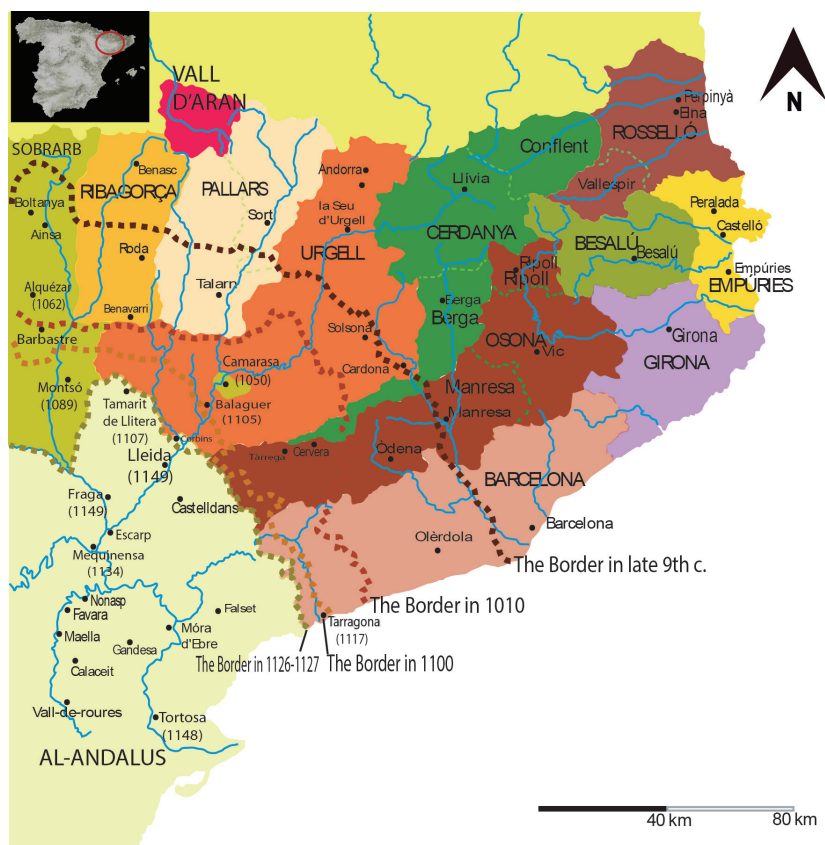


Plate 11.1. Upper frontier of al-Andalus (al-thaḡr al-a'là) and the Christian counties (9th–10th centuries): the incremental Christian conquests of the region, the gradual retreat of the frontier and the dates of the conquest of the main cities and fortresses

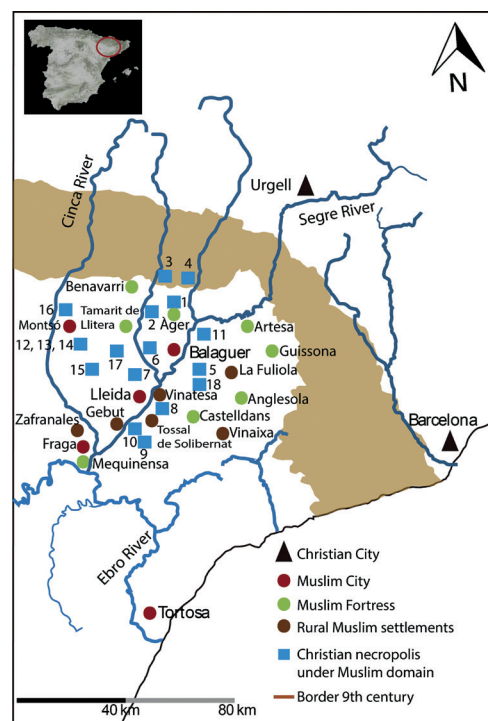


Plate 11.2. Map of the cities, ḥuṣūn, rural settlements and necropolises in the Lleida district.

List of necropolises: 1. Santa Coloma d'Àger; 2. Santa Maria del Camí, 3. Altimiris, 4. Sant Martí de les Tombetes, 5. Necròpolis del Tossal de les Forques, 6. Necròpolis d'Escalç, 7. Necròpolis de la Tossa de Baix, 8. Necròpolis del Muladar, 9. Necròpolis del Saladar, 10. Necròpolis de Cues Roges I i II, 11. Necròpolis de Palous, 12. Tossal del Rito, 13. Castell Sant Esteve de Llitera, 14. La Bassa Siscar, 15. Sas Sant Bartomeu, 16. Acanui, 17. Olrriols I, 18. Les Sogues



Plate 11.3. The north wall of the sudda of Madīna Balaghī (Formós castle) with a typical technique consisting of large ashlars of stone joined with mortar and arranged in a headers and stretchers pattern





*Plate 11.4. The walls of Plà d'Almatà site made of large dry-stone ashlars arranged in rows that adapt to the natural terrain. On top of this ashlar base, the wall was built with the tapial technique*



*Plate 11.5 Tower of La Ràpita (Vallfogona de Balaguer, Lleida)*

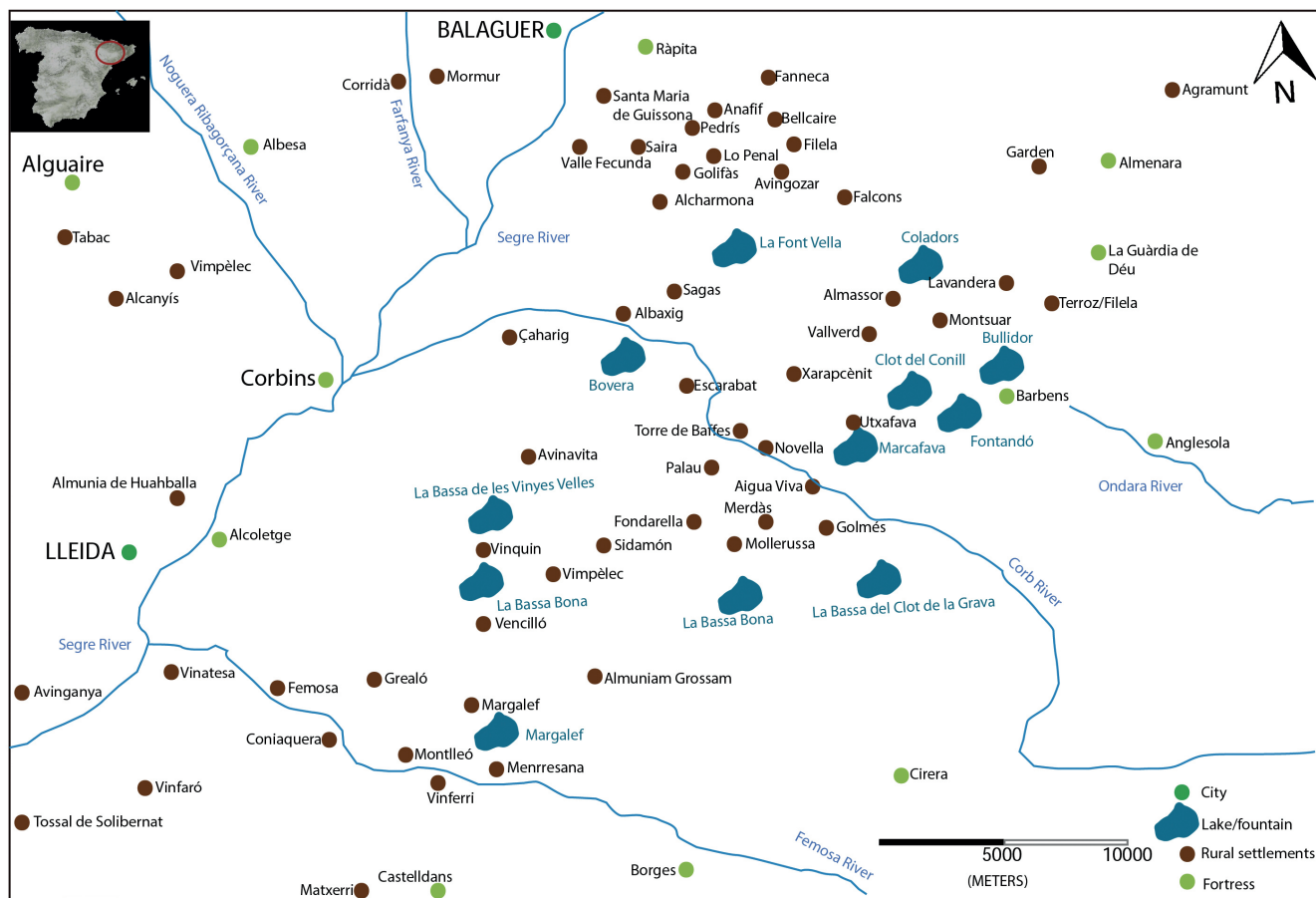


Plate 11.6. Map of the Faix Maškiġān. Distribution of settlements, freshwater springs, and fossilized lagoons

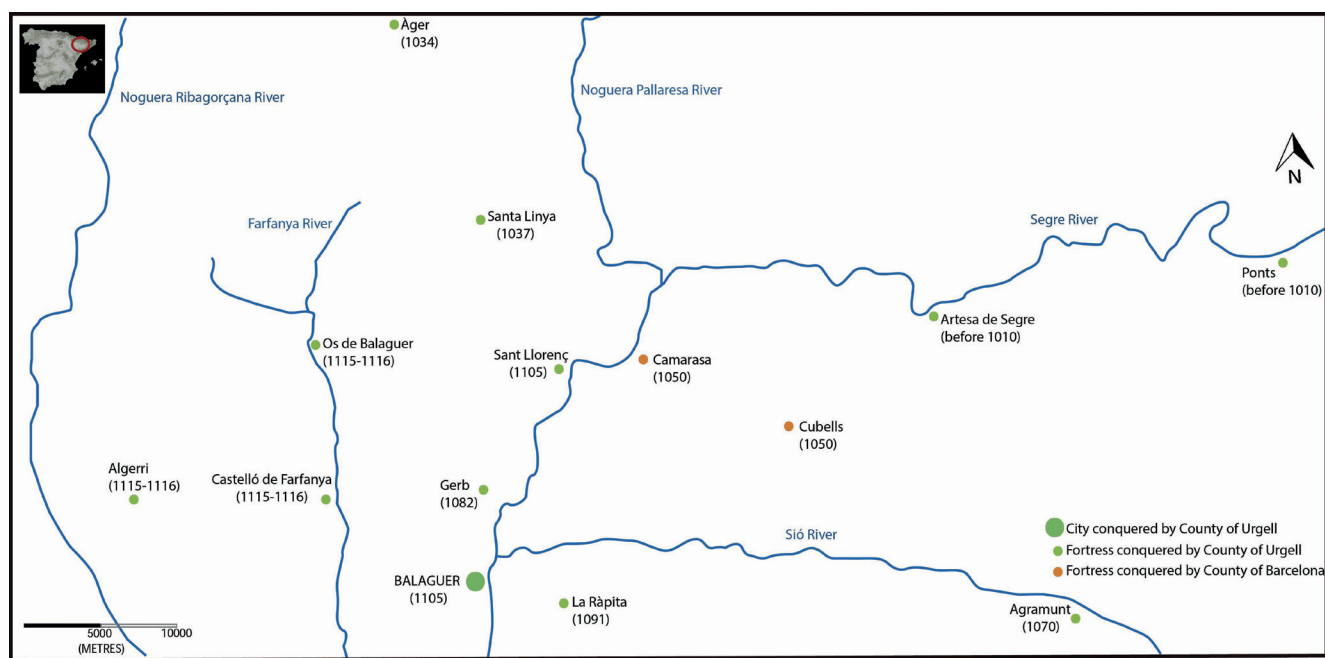


Plate 11.7. Map of the territory of the valley of the river Segre, to the north of the city of Balaguer



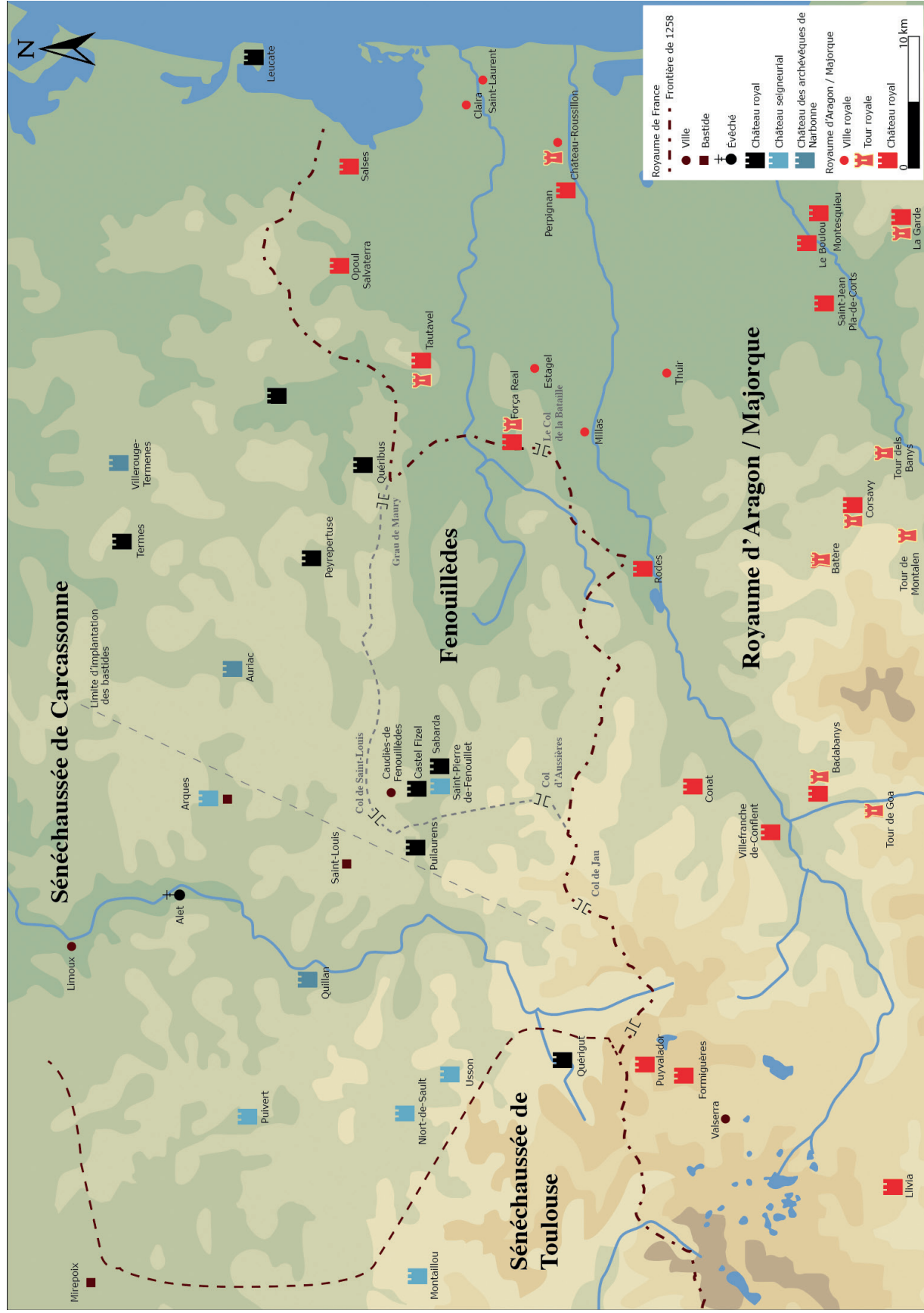


Plate 13.1. Map showing the location of the fortresses mentioned in this chapter on either side of the 1258 border in the eastern Pyrenees